THE EMPIRE COTTON GROWING REVIEW

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ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

1. SUPPLY AND DISTRIBUTION OF THE VARIOUS TYPES OF INDIAN COTTON DURING THE SEASON 1940-41. (*Stat. Bull. No.* 11. Ind. Cent. Cott. Comm., 1942. Price 12 annas.) Gives statistical and other information concerning: area under improved varieties of cotton from 1938-39 to 1940-41; supply and distribution of the various types of Indian cotton during the twelve months commencing September 1, 1939 and 1940; the Indian cotton crop of 1940-41 classified according to staple length; stocks of Indian cotton on January 31, 1942, held by the mills and the trade in Madras Province; exports, etc. Various appendices deal with: Bombay average prices for Broach, Oomras, and Bengals, 1926-27 to 1940-41; Indian cotton crop classified according to staple length, 1926-27 to 1940-41; stocks of Indian raw cotton held by the mills and the trade in India, 1937 to 1941; receipts at mills in India of raw cotton classified by varieties, 1931-32 to 1940-41; consumption of Indian cotton in Indian mills, 1931-32 to 1940-41; exports of Indian cotton and prices, 1926-27 to 1940-41.

2. INDIAN COTTON: REVIEW OF THE 1941-42 SEASON. We have received from Messrs. Chunilal Mehta and Co., Bombay, a copy of the *Indian Cotton Review* for the 1941-42 season. The area under cotton totalled 23,547,000 acres, compared with 23,286,000 acres for the previous season. Production was 6,025,000 bales, against the 1940-41 total of 6,081,000 bales. Yield per acre was 102 lb. compared with 104 lb. for the previous season. Imports of foreign cottons showed a decline of 15 per cent. over 1940-41. Exports of Indian raw cotton, owing to the closing of the Far Eastern markets, were provisionally estimated at around 900,000 bales, a decline of over 55 per cent. from the previous season's total of 2,012,000 bales. On the other hand, due to the absence of foreign competition, exports of Indian cotton piecegoods during the nine months September, 1941, to May, 1942, totalled 736 million yards, compared with 523 million yards for the whole of the 1940-41 season, this constituting an all-time record in the Indian textile industry. An interesting section of the *Review*, under the title of "Looking Ahead," deals with the prospective position of Indian cotton during the season 1942-43. Various statistical tables included in the report are concerned with cotton acreage and yield; world supply, distribution and stocks of Indian cotton; consumption by mills in India; cotton prices in Bombay; etc.

3. REPORT ON THE STAPLE LENGTH OF THE INDIAN COTTON CROP OF THE 1941-42 SEASON. (*Stat. Leaflt. No.* 1, 1942. Ind. Cent. Cott. Comm.) The crop of 1941-42 is estimated by the Government to produce in bales of 400 lb.:

Long staple, over 1 inch	161,000
Medium staple, $\frac{7}{8}$ to 1 inch	2,551,000
Short staple, below $\frac{7}{8}$ inch	3,313,000
Grand total	6,025,000

4. INDIAN GOVERNMENT TO AMEND THE COTTON GINNING ACT. (*Cotton*, M/c, 27/11/42.) A draft Bill to amend the Cotton Ginning and Pressing Factories Act, 1925, has been published in the *Bombay Government Gazette*. The Bill provides for the establishment of rate-fixing committees in local areas and for punishment with fines extending to Rs. 500 for charging rates for ginning and pressing cotton in excess of those fixed by the committees.

5. INDIAN COTTON: MARKETING. By R. G. Saraiya. (*Ind. Text. J.*, **52**, 1942, p. 295. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 490.) The principal features of the Indian Cotton Contract, which was adopted in July, 1942, are discussed and compared with the provisions of the old Broach Contract. The basis of the new contract is Fine M.G. Jarilla cotton, staple $\frac{3}{4}$ inch.

6. INDIAN CENTRAL COTTON COMMITTEE: REPORT OF THE TECHNOLOGICAL LABORATORY, 1941-42. (Ind. Cent. Cott. Comm., 1942. Price 6 annas.) A report of continued progress in the various sections of the Laboratory. The total number of samples received for test reached the record figure of 2,100, compared with 1,800 the previous season, which also constituted a record. Samples received for test at the Testing House numbered 1,445, against 1,120 last year. The Spinning Laboratory, Technological Research, Fibre Testing, and Moisture Testing sections were all occupied in important work throughout the year. Work was continued in the new Ginning section, and the first series of experiments on the pre-cleaning of Indian seed cottons on different machines, and ginning with different speeds and settings in the saw and roller gins, was completed.

7. SPINNING TEST REPORTS ON INDIAN COTTONS, 1941-42. By N. Ahmad. (*Tech. Circs.*, Nos. 503-13, 515-21, 523-26, 528-9. Ind. Cent. Cott. Comm.) The circulars contain the report of the Standards Committee and spinning test results for LSS, Sind Sudhar, Punjab-American 289F/43, Khandesh, Verum, Jayawant, Upland, Farm Westerns, Navsari, and Broach cottons; the grader's report and spinning test reults for Farm Westerns, Broach, Westerns, Hubli Jayawant, Bailhongal, Miraj, Surat, Kadi, Karunganni, Punjab-American 4F, and Tinnevelly cottons; report of the Special Appeal Committee for African cottons and spinning test results for A.R. Kampala, A.R. Busoga, and A.R. Jinja cottons.

8. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1941-42. By N. Ahmad, (*Tech. Circs.*, Nos. 514, 522, 527. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks and conclusions.

Jayawant (*Kumpta*).—Yarns slightly neppy up to 1936-37, but have since shown improvement in this respect. Suitable for 41's warp.

Gaorani 6.—Yarns practically free of neps. Suitable for 35's warp.

289F/K25.—Yarns slightly neppy. Suitable for 41's warp.

9. TECHNOLOGICAL RESEARCH ON COTTON IN INDIA. By N. Ahmad. (Ind. Cent. Cott. Comm., 1942. Price Rs. 2-8-0.) A very interesting account of the work done at the Indian Central Cotton Committee's Technological Laboratory from its inception in 1924 up to 1941. The various sections of the report deal with: The history and objects of the Laboratory; fibre tests and research on cotton fibre and yarn; spinning tests and technological research; moisture content of Indian cottons, and allied problems; exhibits and exhibitions. A useful summary is included of the work carried out during the period under review,

and the success achieved. A list is given of the 89 technical bulletins and leaflets and 494 technical circulars published by the Laboratory during the course of its existence, and illustrations of the various departments are also included.

10. INDIAN COTTON TEXTILES: ORGANIZATION FOR WAR SUPPLIES. (*Ind. Text. J.*, **53**, 1942, p. 4. From *Summ. Curr. Lit.*, xxiii., **2**, 1943, p. 51.) It is pointed out that the Indian cotton industry, comprising about 10,000,000 spindles and 200,000 power looms, in addition to a very large number of handlooms, is playing a leading part in providing not only for India's own armies, but also those of the Empire and the Allies operating in the eastern theatre of war. Conditions of supply and demand during the early days of the war are reviewed, and reasons for the failure of the tender system are explained. The present system of securing war supplies for the Government by the co-operative effort of the accredited representatives of the industry forming the Cotton Textile Advisory Panel and the executive organization of the Government represented by the Cotton Textile Directorate, and the Defence authorities represented by the Controller-General of Inspection and his organizations, is described.

11. INDIAN COTTON CLOTH. (*Man. Guar.*, 6/1/43.) Information from a reliable source in India is to the effect that cotton cloth is being given all the warmth of wool as a result of a series of experiments conducted by a well-known Indian scientist on behalf of the Indian Army. In order to impart to the new cloth the thermal qualities of wool it is treated with the seeds of two trees. The finished product is said to be warm, durable, and soft.

12. COTTON MILLS AND HANDLOOMS: A PLEA FOR CO-OPERATION. By Rao Bahadur K. S. Rao. (*Ind. Text. J.*, vol. liii., January, 1943, p. 101.) The handloom and the power loom should, in a vast country like India, be complementary to each other, but for various reasons there have been very serious maladjustments in the relations between them. Many have endeavoured to solve the problem. Some have suggested that, in order to eliminate the competition, handlooms should specialize in weaving only artistic fabrics, which mills are incapable of reproducing due to intricacy of design and smallness of demand. But the purchasing capacity of an average Indian consumer is too low to permit him to indulge in luxury articles. Others have advocated the weaving of only handspun yarn by the handloom weavers. This, too, is not a practical proposition because the cost of producing *khaddar* is heavy and the quality is so inferior, as compared with cloth of mill-spun yarn, that the demand for it is limited. In this paper the author comes to the conclusion that co-operation between the two industries is the only way out of the present position, and he has tried to show how this co-operation may be brought about.

13. THE ALKALI SOIL PROBLEM AND RECLAMATION METHODS IN INDIA AND CEYLON. By A. W. R. Joachim. (*Trop. Agriculturist*, xcvii., **4**, October, 1941, p. 202.) The author indicates briefly the general position in regard to alkali soils in India, and discusses at greater length the following methods adopted for the reclamation of these soils in that country. *Mechanical:* Under which are included (i) drainage, (ii) leaching with water. *Agronomic:* These include (i) the growing of suitable crops in suitable rotations, (ii) the cultivation of salt-resistant varieties of such crops, (iii) green manuring, (iv) the application of farmyard manure, compost and other bulky organic residues. *Chemical:* Of the chemicals used for correcting soil alkalinity, one type—viz., sulphate of ammonia, molasses and sugar-cane press mud—is utilized, at any rate occasionally, as fertilizer for crops. The other type—viz., gypsum, sulphur, alum and iron sulphate—is rarely, if ever, used for this purpose.

The alkali problem in irrigated areas in Ceylon and its control, with particular

reference to Minneriya, is also discussed, and the need for research on the problem and of detailed soil surveys is stressed.

14. KARNATAK COTTON AND ITS IMPROVEMENT. By S. H. Prayag. (*Ind. Frmg.*, iii., **9**, 1942, p. 488.) The Bombay Karnatak is divided commercially into two cotton belts—viz., Kumpta-Dharwar and Dharwar-American—the average area under each being 968,797 and 253,711 acres respectively. By a process of unit selection in local Kumpta (*G. herbaceum* L., var. *frutescens* Delile) a type suitable to the belt was isolated in 1918 and named "Dharwar 1." This strain was found to be superior in ginning percentage, staple length and spinning quality to the local cotton, but the ginning percentage was still inadequate. Further experiments were carried out and two types, 15-9-9 and 1A-14-3 were evolved by hybridization of Dharwar 1 with Rosea (*G. arboreum* L., var. *neglectum*). The strain 15-9-9, popularly known as "New Cross," spread on account of its superior ginning percentage, but its cultivation is being suppressed because of its high susceptibility to wilt. Search for a wilt-resistant cotton led to the evolution of the Dharwar 2 strain in 1921, but it was found unsuitable for cultivation. By crossing the two pure strains Dharwar 1 and Dharwar 2, a strain popularly called Jayawant (Triumphant) was evolved in 1928. This cotton is superior to Dharwar 1 in ginning percentage, staple length, and wilt-resistance, and 700,000 acres are under cultivation. Jayawant was further hybridized with 15-9-9, and the two new strains evolved, New Jayawant and Early Jayawant, spin almost equal to Jayawant and possess ginning percentages of 31 and 33 respectively, compared with 28 for Jayawant. As a result of continued selection cotton strains have been isolated which, though showing leaf-mottling in the initial stage of growth, are highly resistant to wilt. One of these cottons, K.F.T.-12-2-5, in addition to wilt-resistance, has high yield and quality, and is capable of spinning 44's compared with 40's of Jayawant, but unfortunately its ginning percentage is very low, only 24. American cotton has been grown in the Gadag tract of the Bombay Province since 1842. The New Orleans cotton acclimatized in Dharwar district is called Dharwar-American. In 1910 pure line culture experiments were started and after careful study a type known as Gadag 1 was isolated in 1914. This strain gives on an average 26 per cent. more lint per acre than Dharwar-American, and its staple is longer by $\frac{1}{32}$ inch. During certain seasons, however, Gadag 1 is late in maturing and suffers from red-leaf blight. To eliminate these defects it has been crossed with Co.2, and two segregates—9-7-6-6 and 4-4-1-1—have been evolved. Segregate 9-7-6-6 is characterized by high yield, higher ginning percentage and better quality of staple than Gadag 1, and has so far proved remarkably resistant to red-leaf blight. The segregate 4-4-1-1 is earlier than Gadag 1 by at least three weeks, and gives a much higher yield. Its resistance to red-leaf blight is also outstanding. These two strains are now undergoing rigid yield tests.

15. BOMBAY COTTON MILLS. (*Ind. Text. J.*, **52**, 1942, p. 319. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 579.) Wages in the Bombay cotton mill industry during the last twenty years are reviewed and statistics given. In the period 1921-1937 wages were highest in July, 1926. From 1922 to 1933 the industry was paying a dearness allowance of 70 per cent. and 80 per cent. to time and piece workers respectively. From February, 1938, wages were raised by 12 per cent. From December, 1939, a dearness allowance equivalent to 10 per cent. of the average wages in the industry was paid to all workers. This allowance was revised and placed on a sliding scale in July, 1941, and now varies with the official cost-of-living index number. A study of the average monthly earnings of certain numerically important groups in July, 1926, and during the first six months of 1942, shows that the average earnings of winders, reelers, doffer boys,

etc., have increased by more than 30 per cent. since July, 1926. In addition to the higher wages the Bombay industry paid a war bonus amounting to 12½ per cent. of annual earnings of workers during 1941 or a bonus equivalent to 1½ months' wages in February, 1942. The industry established cheap grain shops in almost all the mills in Bombay for the benefit of employees as early as in December, 1939, and a number of mills also started canteens for their workers.

16. MYSORE: COTTON CONTROL ACT. (*Ind. Frmg.*, iii., **8**, 1942, p. 451.) The extension of cotton cultivation in the Malavalli area and the establishment of a ginning factory at Maddur have been noted previously. While the scheme is progressing, a Cotton Control Act has been passed with the object of maintaining the quality and reputation of the cotton grown in various parts of the State. The Act provides for prohibition or regulation of cultivation of specified varieties of cotton in notified areas for such period as may be deemed fit. Possession, use, and mixing of different kinds of cotton are controlled and trade in inferior cotton is restricted. Import of specific varieties of cotton in quantities of more than 10 lb. and erection of ginning and pressing factories are subject to licence. The varieties of cotton and the zone from which cotton may be ginned in the factory may also be fixed by the licence.

[*Cf.* Abstr. **305**, Vol. XIX. of this Review.]

17. STUDIES IN THE PERIODIC PARTIAL FAILURES OF THE PUNJAB-AMERICAN COTTONS IN THE PUNJAB. V. PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS ASSOCIATED WITH *Tirak* (BAD OPENING OF BOLLS). By R. H. Dastur and K. M. Samant. (*Ind. J. Agr. Sci.*, xii., **3**, 1942, p. 474.) The soils where *tirak* (bad opening of the bolls) occurs have been found to contain abnormal amounts of sodium salts (0·2 per cent. or more) in the subsoil from the third or fourth foot downwards. The soils contain more sodium in the soluble or exchangeable form than calcium. Such soils may be located in an entire field or portions of it, and may be surrounded by normal (non-saline) soils; *tirak* occurs every time cotton is grown on them. On soils of medium (0·1-0·15 per cent.) total salt content *tirak* does not appear under favourable weather conditions and adequate water supply, but develops in dry and warm weather or in the absence of adequate water supply. The physical texture of the soil, the sodium/calcium ratio and the relative amounts of different sodium salts present affect the intensity of *tirak*. Another soil type on which *tirak* occurs is the light sandy land which produces a deficiency of nitrogen in the plant at the flowering stage. These soils are otherwise normal and *tirak* can be ameliorated by the application of sulphate of ammonia. The light sandy soils may contain normal (non-saline) subsoils or may also contain subsoils with sodium salts or with low sodium/calcium ratio in exchangeable form. If the soil is light sandy with salinity in the subsoil, *tirak* occurs in the most intense form. All these soil types may be found in the same square (25 acres). The relationship of these soil conditions with *tirak* was established from a study of (1) a growth of the crop in small plots, (2) results of detailed analysis of the soil underneath normal and *tirak* crops, (3) results of mineral analysis of the leaves, (4) the response to the application of sulphate of ammonia, and (5) the tannin test. Sandy loams with a saline subsoil did not respond to applications of sulphate of ammonia, while a light sandy soil without salinity gave a high response to this fertilizer.

VI. THE EFFECT OF SODIUM SALTS ON GROWTH OF PLANTS AND DEVELOPMENT OF *Tirak*. By R. H. Dastur and S. Singh. (*Ind. J. Agr. Sci.*, xii., **4**, 1942, p. 603.) The investigation was divided into two sections. Section I. included the study of the growth of the American cotton plants under known conditions of soil. These were: (1) normal soils where *tirak* did not occur, (2) sandy loams with a saline subsoil where *tirak* was known to occur, and (3) light sandy

soil with a saline subsoil where *tirak* was also known to occur. Section II. dealt with the effects on the growth of the American cotton plants of artificial applications of sodium salts to a field with non-saline normal land. An attempt was made to obtain experimental evidence to support the view that the presence of sodium salts in abnormal amounts in the subsoil was causing *tirak* in the Punjab-American cottons. The growth of cottons was depressed in the presence of salinity in the subsoil as compared with the growth made by plants on normal soils. The depression in growth was greater in sandy loams than in light sandy soils, the subsoil being saline in both cases. The numbers of bolls per plant were greatly reduced in the former but not in the latter type of land. The bad opening of the bolls as measured by the weight of seed cotton per boll occurred in all soils with saline subsoils, and the yields were lowered. These effects of salinity on the growth and yields were found to be significantly depressing when compared with the growth and yields of plants on normal soils. Similar depressing effects on growth and yields were produced by applications of sodium salts to a known normal soil. There were, however, some differences in the effects produced on the cotton plant by each kind of sodium salt. Sodium chloride in high concentrations (16,000 lb. per acre) depressed the vegetative growth as well as the yields; thus bad opening (*tirak*) of the bolls was produced in the presence of this salt. Sodium carbonate, though depressing the vegetative growth, was found to have a stimulating effect on boll size and yields when used in low concentrations (4,281 lb. per acre). This salt in double concentration further depressed the vegetative growth and showed less stimulating effect on the fruiting parts than was found with low concentrations. Sodium chloride and sodium carbonate had no effect on node numbers but decreased the internodal lengths, indicating that they caused a disturbance in the water supply of the plants. Sodium bicarbonate, under either low or high concentrations, showed no effect on growth or yield. In the presence of sodium carbonate the depressing effect of chloride was found to increase, while in the presence of bicarbonate the depressing effect of chloride on growth and yields was found to decrease. Sodium chloride was present in abnormal amounts in the soils where *tirak* was found to occur, while sodium carbonate was not always present in such soils. As bicarbonates and sulphates at the concentrations in which they were present in the soil were not found to show deleterious effects on plant growth, sodium chloride appeared to be mainly responsible for development of *tirak* in American cottons. The presence of other sodium salts may either aggravate or lessen *tirak*, depending on the relative proportions of these salts and their actual concentrations in the subsoil.

[*Cf.* Abstr. **724**, Vol. XVI., **238**, Vol. XIX., and above abstract.]

18. UNITED PROVINCES: NEW STRAINS OF COTTON. By C. Maya Das. (*Ind. Frmg.*, iii., **8**, 1942, p. 498.) Out of the survey material collected during 1933-35 the strains D, A, 34/4 and 35/6 are promising. Strain D, while comparing favourably in quality with C520, has given a higher yield for the third year in succession. Some of the selections from C520—viz., C520/2 and C520/3—have also been found superior in quality to C520 bulk. The trials of the American varieties LSS, 100F, 83F, Perso-American, N15 and 289F, against C520 at the Kalai, Aligarh and Kiserwa farms have shown that all the American varieties give higher yields than C520.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

19. ASIA. COTTON CULTIVATION IN CEYLON. By J. C. Haigh. (*Trop. Agriculturist*, xcvii., **4**, October, 1941, p. 190.) The author gives an interesting account of the history of cotton cultivation in Ceylon. Climatic conditions in the island are not generally favourable for cotton, but parts of the dry zone are suitable for its cultivation. Cotton should be grown as a rotation crop in village settle-

ments. With the present method of " chena " (shifting) cultivation the average yield is not more than 2 cwt. of seed cotton per acre, whereas on the experiment stations, under a system of rotation, the yields are considerably higher. The most suitable variety for cultivation would appear to be a medium-stapled American Upland cotton. Since 1925 Cambodia has been the variety issued to cultivators, but in recent years mills have complained of its deterioration in quality. Selection work with a number of varieties is in progress. It is estimated that with the methods of cultivation now practised in Ceylon the output of cotton is unlikely to exceed 8,000 cwt. annually. Under the present contract the mills in the island will take up to 10,000 cwt. per annum, which represents only a fraction of their total requirements. Further developments in cotton cultivation may be made possible by the irrigation schemes which are now beginning to function in the dry zone.

20. CYPRUS: COTTON VARIETY TRIALS, 1941. (*Ann. Rpt. Dir. Agr.*, 1941, received 1943.) Weather conditions were the worst for many years. Rainfall during the late winter of 1940-41 had been very low and the spring and summer which followed were dry and hot. Added to this the winter rains of 1941-42 did not begin until December in most agricultural areas, instead of, as normally, in October, and as a result the production of cotton was poor. Thirteen comparative cotton trials between the varieties Coker 100 and Triumph (the variety mainly grown) were carried out in different districts, and confirmed the two previous years' findings that Coker 100 is superior to Triumph under all conditions in quality, yield and ginning outturn.

21. AFRICA. EAST AFRICA: COTTON SEASON, 1942-43. (*Uganda Herald*, 23/12/42.) The Governments of Kenya, Uganda and Tanganyika have decided to purchase the whole of the cotton crop in their respective territories at a fixed price level for the season, and to make arrangements for disposal with minimum possible interference with normal trading channels in East Africa. In Kenya and Uganda, where the matter presses, it is proposed to dispose of the crop through an approved Exporters' Group operating in Kampala. It is anticipated that similar arrangements will later be made in respect of the Tanganyika crop. A Formation Committee is being set up immediately to advise Government on the constitution and method of operation of the Exporters' Group.

22. GOLD COAST: COTTON PRODUCTION. (*Crown Colonist*, February, 1943, p. 135.) Cotton is grown in quantity only in Togoland, where most farmers grow it interplanted among food crops. The crop for 1941-42 was estimated at 25,000 lb. seed cotton, and the lint will mainly be used locally for weaving cloth and making thread. Demonstrations of an improved type of spinning wheel were made in the district by the staff of Achimota College. More recently an advertisement has appeared in the Home papers for a spinner for the College who should be conversant with the process of dealing with raw cotton up to the finished yarn.

23. NIGERIA: COTTON INDUSTRY, 1941-43. (*Half-yearly Rpt. to September* 30, 1942.) *Northern Provinces.*—The 1941-42 cotton crop showed a considerable reduction over the previous season, due, as stated in the previous report, to unfavourable weather and to changing war conditions.

The quantity of seed issued for the 1942-43 season was 5,391 tons, which was 693 tons less than in 1941. A slight decrease was general in all cotton-growing provinces and was attributed to the preference given to grain and groundnut cultivation. Propaganda was carried out to ensure economy in the use of seed. In Katsina Province an increased acreage was sown, but as most of the cotton was planted late and rainfall was below average, the crop is not

expected to exceed 15,000 bales. Transport difficulties in the Niger Province made it impossible to distribute seed according to plan; the crop was planted late, but weather conditions were favourable. In Zaria Province 20 per cent. less seed was distributed, and the number of markets it is proposed to open has been limited to seven in an effort to reduce the motor haulage needed to transport seed cotton to the ginneries. Crop prospects are favourable in the Bauchi, Sokoto and Bornu provinces. With the rise in the cost of living, and increased demand for locally woven cloths, it is somewhat doubtful if the estimate for the Northern Provinces of 28,000 bales for export will be realized.

Southern Provinces.—An excellent crop of 14,705 bales was produced in 1941-42, and the quality was good. Prices were less than the previous season, being 8s. 2d. per cwt. compared with 8s. 9d. in 1941. A total of 77 tons of seed was distributed for the 1942-43 season, compared with 92 tons in 1941, the main cause of the decrease being unusually dry weather experienced in July and August.

24. NYASALAND: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Dpt. Agr.*, 1941, received 1942.) The total number of growers in the whole Protectorate was approximately the same as in the previous season; production, however, was much reduced owing to the very dry season in the Southern Province. In the Lower River area the acreage under cotton was much less than in 1940 owing to the fact that individual gardens were smaller, and because many natives, although they prepared land and took seed, were unable to plant for lack of rain. Fully half the acreage planted in this area failed completely, and everywhere the plants ceased flowering and died after the main crop had been harvested in June and July. Drought alone was the limiting factor, since insect attack was comparatively light. In the Northern Province high yields per acre were obtained in Kota Kota, Dowa, Dedza, and Ncheu districts and production was 47 per cent. greater than last year. The rains, though less than usual, were well distributed and therefore adequate for the crop. Insect pest attack was relatively slight, since the drier weather was unfavourable to its development, and the close season had been rigorously enforced. In the North Nyasa District the rains were shorter and more erratic and the crop was about the same as last year. The total production in the Northern Province showed an increase of 28 per cent. on that of 1940. The cotton was bought in two grades only this year: "Good," which averaged 1·08 pence per lb., and "Ordinary," which averaged 0·299 penny per lb. The total sum paid out to Native Trust Land growers was £24,259.

At the Domira Bay Station of the Empire Cotton Growing Corporation good average yields of cotton were obtained in spite of the short growing season consequent upon the rains starting late and ceasing early. The close season measures for the control of pests continued to be successful. The high-yielding strains, varieties and crosses accumulated at the Station were planted in small plots pending the results of the examination of lint samples sent to England, on consideration of which those below a certain standard of lint quality would be eliminated. Yields ranged from 374 lb. seed cotton per acre for N.17 from Uganda up to 738 lb. for the high-yielding U4 × Cambodia × U4 cross HK. 95 per cent. of the cotton was clean and white. A small bulk trial was planted but suffered severely from termite attack. Termite damage to cotton was common where cotton was grown on land previously resting under pigeon pea. It was shown that damage to cotton following pigeon pea was ten times as great as when cotton followed groundnuts, and the main rotation was provisionally modified for cotton to follow maize and groundnuts. The work of the Insect Pest Control Staff of the Corporation was continued during the season, and much useful information was obtained in connection with the two major pests of cotton, red bollworm and stainer.

25. COTTON INDUSTRY, 1941-42. (*Nyasaland Agr. Qrtrly. J.*, **2**, 4, October, 1942, p. 2.) Marketing in the Southern Province commenced in August when over 2,600 tons of seed cotton were sold. The Chikwawa crop is considerably heavier than anticipated, and is estimated at 4,000 tons. The late crop in the Chiromo area and the south has been attacked by red bollworm. In the Central Shire District the total bought during August exceeded the original estimate of 150 tons by 26¾ tons. In North Nyasa 67 tons of cotton seed have been issued.

26. PROSPECTS FOR THE 1942-43 SEASON. A report issued by the Department of Agriculture in February last stated that in the Southern Province good planting rains had been considerably later than usual, with the result that cultivators were still engaged with their food crops at the time when they would normally have given their attention to cotton. In the Lower River districts the final acreage under cotton might possibly be less than in the previous season, the yields largely depending upon whether there were any prolongation of the rainy season to compensate for the tardy beginning. In the Northern Province prospects were slightly more favourable, and increased production might be expected if growing conditions during the next two months were satisfactory.

27. A SIMPLE METHOD OF MAKING COMPOST. By A. P. S. Forbes. (*Nyasaland Agr. Qrtrly. J.*, **2**, 4, October, 1942, p. 21.) Propaganda has been carried out in Nyasaland for the past four years to induce the native cultivator to make compost, since the Indore process was found too complicated for general use. The simpler process advocated consisted of digging shallow pits near the cultivator's home, throwing all the house refuse into the pits, as well as quantities of easily available green weed refuse, leaves of trees, and grass. Little water was added apart from the natural rainfall, and the heap might be turned 2 or 3 times during the wet weather. The compost took between 3½ and 4 months to manufacture, and it was definitely beneficial to the native crops. The results of the first year of a trial commenced in 1941 to test the relative values on plots of maize of Indore compost, village compost, and no compost, indicated the superiority of the Indore compost over the village compost, but the latter, in turn, gave better results than the no-compost plots. A chemical analysis showed the Indore compost to contain almost double the amount of nitrogen and phosphoric acid, and three times the amount of potash compared with the village compost, and the final C/N ratio was appreciably higher. The results in the field suggest that perhaps in the first year much larger percentages of the plant food materials were available in the case of the Indore compost. Naturally, the more ash and animal refuse added to the village compost the richer would be the final product. A modification of the native system of compost-making is suggested for European estates in Nyasaland. The following are the costs per ton of the different processes: Village compost, 10d.; Village compost, with water added artificially, 1s. 5d.; Indore compost, 3s. 1d.

28. SOUTHERN RHODESIA: COTTON INDUSTRY, 1941-42. From the report of the Cotton Specialist, Major G. S. Cameron, we learn that the season opened favourably for cotton, but the early promise was not maintained. The crop lived up to its reputation, however, of being able to withstand prolonged droughts, and in the end results were much better than anticipated.

At the Cotton Station, Gatooma, the results of variety trials showed two new strains, 9L18 and 9L34, to be well ahead of any other strains at the time available. In addition to being good yielders, they showed a definite improvement in lint quality and good opening, and are now in process of being bulked up for commercial issue. In rotational trials, maize following cotton on poor land gave much improved yields, but the same results were not obtained on

land which had been composted. Work on the design and manufacture of a reliable compost spreader had to be abandoned, but the low loading wagon, constructed for the collection of farm waste, continued to give satisfactory service. In the cotton breeding experiments, only two out of six strains under trial were retained. Third-generation progenies of some of the colchicine and other "doctored" plants continued to show prolific flowering and fruiting, one such family creating a record in this respect as far as Southern Rhodesia is concerned; but unfortunately the flowers were small, and some of the lint was not up to expectation. Over a thousand plant selections were made in the field, many of these from material crossed and backcrossed prior to 1938, but over half of the selections were rejected after laboratory examination, mostly on account of lack of character in the lint. The crop suffered very little from pests, with the exception of termites, which appear to be causing more damage than in former years. There was very little angular leafspot disease and no evidence of blackarm, but during the drought period, early in the season, seedlings were reduced by attacks of "sore-shin" fungus. Owing to the larger crop ginning operations had to be continued much longer than in previous seasons. The preliminary stages of the absorbent cotton wool industry were negotiated, and the boiling process suitable to local conditions was evolved. Much appreciation is expressed of the help of the Chief Chemist and staff of the Division of Chemistry in connection with the various problems of this industry Opening machinery, carding engines, and interleaving apparatus were installed during the year. The spinning mill buildings were nearly completed, and should be ready for occupation early in 1943.

Prospects for the 1942-43 Season.—In this connection Major Cameron writes: "It is difficult to forecast what increase in cotton acreage is likely to take place in the ensuing season. In the Hartley district the increase is considerable, but not excessively so. Results of planting in other districts have not yet come to hand. The further expansion of the native cotton-growing industry is now the responsibility of the Department of Native Affairs, although the main issues of cotton seed and the responsibility of purchasing the crop remain with the Cotton Research and Industry Board. Under this arrangement it is confidently expected that native cotton growing will go ahead, but to achieve more rapid progress it is felt an experienced officer of the Native Department should be detailed specially for cotton propaganda purposes."

29. Summary of Cotton Pickings at the Cotton Station, Gatooma, 1942. (*Rhod. Agr. J.*, Sept.-Oct., 1942, p. 346.) Expressed as percentage of native labour able to pick categorical amounts of seed cotton per man per day.

(*Average of first and second pickings.*)

Per cent.					*lb.*		*lb.*
2	of the labour	picked	between		30	and	35
2	,,	,,	,,	,,	35	,,	40
9	,,	,,	,,	,,	40	,,	45
18	,,	,,	,,	,,	45	,,	50
24	,,	,,	,,	,,	50	,,	55
38	,,	,,	,,	,,	55	,,	60
6	,,	,,	,,	,,	60	,,	65
1	,,	,,	,,	over	65		

The average yield of seed cotton per acre was 650 lb.

The crop opened earlier than usual and was over-ripe before harvesting was possible. This resulted in the cotton being easier to pick, as it came away freely from the bolls, and there was little "pulling" to be done. Such easy picking conditions should not be expected in, say, a year of late autumn rains.

30. BULLETIN FOR COTTON GROWERS. By G. S. Cameron. (*Rhod. Agr. J.*, Sept.-Oct., 1942, p. 341.) A revised edition of the previous Cotton Bulletin No. 1157, the supply of which has become exhausted. The information given is concerned with cotton as a rotation crop; choice of land; preparation of the soil; machine or hand planting; thinning; cultivation and weeding; fertilizing, use of compost; harvesting; ratooning. Under the heading of Ginning and Marketing notes are included on the packing of cotton; marking of woolpacks; despatches to ginnery; ginning fee; payment for crop; guaranteed prices; ginning outturn; and seed supply. In conclusion, the author makes the following recommendations: Prepare land in plenty of time and secure a good even tilth; order seed well in advance; plant shallow and as early as possible, say in November; use plenty of seed; thin out plants when 4-6 inches high to single plants spaced at intervals of 6 inches.

31. SWAZILAND: COTTON PRODUCTION PROGRESS. (*Crown Colonist*, February, 1943, p. 149.) Discusses the efforts made by the officers of the Empire Cotton Growing Corporation to encourage cotton growing among natives in Swaziland, with a view to introducing a new outlook on agriculture by means of cotton as a cash crop. Progress in agriculture is badly hampered by the natives' lack of money and equipment, though they may be the owners of substantial herds of cattle. Their only implements are a plough and a hoe, both of which are often practically worn out. Money to purchase adequate equipment can best come from the sale of a cash crop, and over large areas in Swaziland cotton can fulfil a most useful rôle in this respect, and promote a gradual rise in the standard of living of the natives.

32. SUDAN: COTTON INDUSTRY, 1941-43. A report received from the Department of Agriculture states that the 1941-42 cotton crop was substantially less than that of the previous season in spite of the increase in yield of the American variety over that of 1940-41. The decrease in the Sakel cotton crop was due to small crops at Tokar and on the White Nile Private Estates.

Prospects for 1942-43.—In the Gezira the crop is a better one than last season, but harvesting may be hampered by shortage of labour. Prospects are good in Tokar and the Gash Delta. In the former area X1730A has been sown instead of Sakel, but both cottons have been planted in the Gash Delta and on the White Nile Estates. No cotton has been sown in the Berber and Dongola areas, food and forage crops being deemed of greater importance. In Kordofan, also, the cotton acreage has been reduced owing to the necessity for the greater production of food crops.

33. COTTON PLANT: ROTATION EXPERIMENTS IN THE SUDAN GEZIRA. By F. Crowther and W. G. Cochran. (*J. Agr. Res.*, **32**, 1942, p. 390. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 580.) A detailed account is given of rotation experiments with cotton in the Sudan Gezira. The results show that frequent fallows are the first necessity in any rotation for cotton in the Sudan Gezira. Cotton should not be sown more often than once in three years, and even that may be too frequent for maximum yields. Between cotton crops at least a year's fallow is essential, and the longer the fallow the greater the benefit. The experimental results support fully the soundness of present rotation throughout the Gezira scheme. Up till 1932-3 the rotation was three-yearly, with at least one full year's fallow per cycle. Then the rotation was changed to four-yearly, with two or three years' fallow per cycle. Inclusion of dura (giant millet) in the rotation invariably reduces cotton yields. Least harm is done when dura immediately follows cotton, with at least one fallow year before cotton recurs. Lubia (hyacinth bean) was in no case markedly superior to fallow, but may prove slightly more beneficial than fallow when included in a short rotation

following cotton or dura. On the other hand, if grown after fallow, lubia decreases the cotton yields. In view of the large increases regularly obtained from nitrogenous fertilizers, the benefit of lubia is surprisingly small and that of fallow surprisingly great.

34. Influence of Weeds on Cotton in the Sudan Gezira. By F. Crowther. (*Emp. J. Exp. Agr.*, xi., **41**, January, 1943, p. 1.) The paper describes two related experiments investigating the effect of hoeing weeds on the growth and yield of cotton in the Sudan Gezira. In one experiment the weeds grew among the cotton crop, and in the other on bor (resting) land which did not come under cotton until a complete year afterwards. The results of the first experiment demonstrated the wisdom of the current practice of clean-weeding from cotton-sowing onwards. Where weeds were allowed to grow unrestrictedly up to 2 months after sowing, the cotton was severely checked in its early growth and final yields were reduced by up to 30 per cent. In the two treatments of the second experiment, (*a*) the normal practice of allowing weeds on the bor-land, destined for cotton a year later, to ripen and dry off at the end of the rains, was compared with (*b*) cutting the unripe weeds at ground-level while they were still growing rapidly. Cutting the unripe weeds conserved moisture in the soil until the following rains 8 months later, increased soil nitrates five-fold, and led ultimately to an increase in the yield of the cotton crop by 43 per cent. over that of normal practice. An additional 10 kg. per feddan nitrogen were taken up by the cotton crop when the unripe weeds had been cut a year previously. Possible agencies are suggested for the cause of this difference, but existing information precludes assessment of their relative importance. Under normal practice termites may cause wastage of nitrogen by removing ripe weeds down to a soil zone untapped by the cotton roots, or ammonia may be lost during the breaking-down of protein in the alkaline soil. Nitrogen-fixation in the soil may be prolonged where moisture is conserved. Since throughout the Irrigation Scheme the bor-weeds are normally allowed to ripen without interference, the results indicate how a general increase in cotton yields may be attained.

35. Tanganyika: Annual Report of Department of Agriculture, 1941. (Received 1942.) The year was on the whole a disappointing one climatically. In those parts of the Territory which usually get their main rains between November and May the crops got off to a good start, but this early promise was more than neutralized by the abrupt cessation of the rains altogether at the end of March, and the result was that in these areas, although cotton did extremely well and was of high quality, grain and other crops had only a moderate season. Cotton production during 1941 reached a record of 72,766 bales, exceeding the previous record of 67,369 bales in 1936 by more than 5,000 bales. The Lake Province produced a crop of just over 50,000 bales, which was the highest recorded for this area, and reflected great credit on the work carried out over many years by the staff of the Department and officers of the Provincial Administration associated with them. The Lake Province crop was disposed of satisfactorily, but some little difficulty was experienced at first with the rest of the Territory's cotton; this, however, was later overcome, and with the exception of some 2,000 bales, mostly of poorer qualities, the rest of the crop was disposed of at very good prices.

36. Uganda: Cotton Prospects, 1942-43. The latest information from the Department of Agriculture states that 878,578 acres were planted to cotton. In general, weather conditions during the usual planting period were dry, with the result that over half the crop was sown in August. Continued propaganda to obtain closer spacing met with encouraging response from growers in most

districts. Unfortunately dry weather again set in towards the end of September, and, with the failure of the normal " autumn " rains, most of the acreage planted will give very poor yields. Reports of grade are good in all areas, but length and strength of staple are below average owing to the adverse weather conditions. The marketing of the crop in the Eastern Province and the northern part of the Western Province began on January 25. In Buganda and the remainder of the Western Province marketing will begin on February 11. Prices have been fixed for each zone throughout the buying season.

37. UGANDA COTTON CROP AND INDIA. (*Man. Guar.*, 25/1/43.) The failure of the late rains which is reported from East Africa, though it will not affect the food crops, which depend mainly on the first rains, will affect the Uganda cotton crop, which depends particularly upon them. The Uganda cotton crop was rather below the average in 1941-42, with 236,370 bales of 400 lb. With Japan out of the market, India is more important than ever as a buyer, and in fact it took nine-tenths of total exports in 1941. India's demand is persistent in view of the difficulties in getting long-staple types from the United States.

The co-ordinating Supply Council recently established for East Africa is making every effort so to control distribution that prices do not rise unduly. By a system of registered distribution through recognized wholesalers the first commodities to be controlled include certain lines of cotton goods imported from India. An Exporters' Group is being formed to deal with the disposal of all East African cotton, but for sales of cotton to unregulated markets such as India there is not likely to be any willingness to forgo all the profit available merely so that there may be extra profit for Bombay market speculators.

38. WEST INDIES. BARBADOS: COTTON INDUSTRY, 1942-43. (*W. Ind. Comm. Circ.*, December, 1942, p. 211.) Up to the end of August, 1942, applications to plant only 372 acres had been received, and it was certain that the total acreage would be less than that of the previous year. This was disappointing since cotton was urgently required by the Imperial Government for war purposes and cotton seed locally for cattle food and edible oil. The smaller acreage might be accounted for by the dry weather prevailing at seed distribution time, the fact that some growers were unaware that cotton would count as part of the requirements under the Local Food Production (Defence) Control Orders, and the severe caterpillar defoliation of the previous season.

39. ST. LUCIA: GUATEMALA GRASS AS A FODDER CROP. By G. B. Gregory. (*Trop. Agr.*, October, 1942, p. 192.) An experiment with Guatemala grass, laid down in 1939 on an alluvial soil of medium fertility, is described. Simple manurial treatments showed no significant differences, but with a cutting rotation of 8 weeks and extending over nine rotations a mean yield of 4·71 tons per acre per cutting was obtained, equivalent to 30·1 tons per acre per annum. Yields fell rapidly as the trial progressed, due, apart from seasonal rainfall variation, to the fact that in accordance with present local practice only one initial manuring was given. It is suggested that planting in furrows is preferable to flat planting in order to obtain a more firmly established stool; a furrow spacing of 3 feet with stools at 1 to 1½ feet in the row might be more feasible than using a 2 by 1½ feet spacing. From its behaviour under the conditions of the experiment, and from field observations in other planted areas, Guatemala grass is recommended as a dual fodder and erosion-control crop for contour strip planting on sloping land; it can thus contribute to the solution of two of St. Lucia's most urgent agricultural problems.

40. ST. VINCENT: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Dpt. Agr. St. Vincent*, 1941. Received December, 1942.) *Sea Island Cotton Industry*, 1940-41.—From the estimated total area of 5,180 acres 1,527 bales of 400 lb. were obtained.

The late crop was adversely affected by the early and severe dry season, and the yield averaged only 117·9 lb. of lint per acre. Damage by diseases and pests was relatively small. The whole of the white lint was sold to the Ministry of Supply at 25d. per lb. f.o.b. Stained lint was shipped on consignment to the United Kingdom and sold at 9d. per lb. c.i.f., which was 1d. less than the general price obtained in 1940.

1941-42 *Crop.*—An estimated area of 4,747 acres was sown, which represented a decrease on the 1940-41 acreage. A total of 49,356 lb. of planting seed was sold by the Government Cotton Ginnery compared with 45,656 lb. in 1940. Germination was patchy, possibly from the severe dry season in 1941, causing damage to the seed. Growth conditions were on the whole fair, and the crop made good progress to the end of the year. Attack by *Alabama argillacea* was serious in the North Windward and the Leeward Districts, and where spraying with lead arsenate was delayed the plants were completely defoliated, some 400 acres being damaged in this way.

Marie Galante Cotton Industry, 1941-42.—The crop is grown exclusively in the South Grenadines and was rather better than usual, production being 198 bales of 300 lb. each. The whole of the lint was exported on consignment to the United Kingdom.

41. Cotton Experiment Station, 1940-41. By H. L. Manning. (*Ann. Rpt. Dpt. Agr. St. Vincent*, 1941. Received 1942.) Maintenance and improvement of standard V.135 was carried out during the season, and comparison against the new VH hybrid material indicated the satisfactory progress of the latter. The greater variance of this VH material offers more scope for improvement than the comparatively stable V.135 material. In addition to other routine plant-breeding investigations a manurial experiment, with two levels each of nitrogen and potash and early and late application, was planted. Results indicated no significant advantage to be gained from an early application of the fertilizers. As may be expected under St. Vincent conditions, the nitrogenous fertilizers had the greatest effect on yield, though the importance of potassic fertilizers in seed formation also was apparent.

42. Studies of Oil Formation in the V.135 and M.S.I. Varieties of Sea Island Cotton in St. Vincent, B.W.I. By C. C. Seale. (*Trop. Agr.*, November, 1942, p. 210.) Data are presented showing the importance of the production of cottonseed oil in St. Vincent. Experiments were carried out during the 1938-40 crop seasons to determine the effect of manuring on oil formation and the rate of development of oil in the V.135 and M.S.I. varieties of Sea Island cotton. Results with manuring showed that nitrogen affected both the oil content and the total yield of oil of mature V.135 seed, the former being decreased and the latter increased significantly. The nitrogen effect on oil content was confirmed with developing V.135 seed, and was also in line with the results of American investigators on Upland cotton. Potash and phosphate produced very little effect on mature or developing V.135 seed. In tracing the rate of development of oil in the two varieties the following results were obtained. Moisture content decreased with an increase in the age of the seed, the decrease following boll split being the normal drying out of the mature seed. There was a period of intense oil formation in both varieties extending from about the 25th to the 40th day; this grand period of oil formation occurred some 10 days earlier in an Upland variety. Splitting of the bolls commenced in both varieties between the 40th and the 45th day; the entire period occupied about 15 days for M.S.I. as compared with about 20 days for V.135. At the commencement of the splitting of the bolls oil formation had already ceased. The rate of oil formation in the two varieties was practically the same, although

there was a seasonal variation in the oil content of both cottons. The oil content of mature Sea Island seed was on the whole higher than that of American Upland seed. After the 30th day of age the refractive index of the oil in the seed showed a slight increase with an increase in the age of the seed. There was little difference between the refractive index of the oil of mature Sea Island and Upland seed.

43. AUSTRALASIA. QUEENSLAND: COTTON INDUSTRY, 1941-42. (*Rpt. Dpt. Agr. and Stock, Qnsld.*, 1941-42.) Adverse climatic conditions during the later months of the previous cotton season continued almost unbroken during the first half of 1941-42, and the area planted to cotton was reduced to roughly 50,000 acres, although sufficient seed was supplied to plant 73,000 acres. Some outstanding yields were obtained from irrigated areas in the main cotton-growing districts. Yields resulting from the practice of growing cotton under dry farming conditions again indicated that the difficulties associated with this system were being successfully overcome.

In connection with breeding and selection work, progress was made in the attempt to obtain superior strains of Oklahoma Triumph, one of the most promising quick-maturing cottons grown in Queensland. A very satisfactory strain of Lone Star was evolved which appeared worthy of test as a rain-grown crop. Stoneville was another variety which showed improvement. Improvement work was also continued with New Mexico Acala, which may become a leading cotton for the production of an inch or longer staple in the drier districts. Much interest again centred in the breeding work on the Miller variety, partly because it is the most extensively grown cotton in the State, and partly because of the important rôle it is playing in the work of evolving a jassid-resistant cotton. Satisfactory progress has been achieved in this direction, since 49 out of 100 Miller strains planted in a jassid-infested area gave promise of being jassid-resistant and of producing a suitable type of fibre.

44. FIJI: COTTON INDUSTRY, 1941-42. A report received from the Director of Agriculture states that no commercial crop of cotton was grown in Fiji during the season under review. The work of the Experimental Station was restricted to the maintenance of the existing strains, Sea Island and Sea Island Backcrosses 172, 172/23/1 and 172/23/5. In connection with breeding and selection work, 25 progeny rows of Kidney-Sea Island Backcross, Third Backcross, Montserrat Sea Island and Sea Island were grown. All the strains were heavily infested with jassids, causing shedding. Individual records of progenies could not be kept, but yield figures of the different strains were extracted as follows:

Backcross	84 lb. seed cotton per acre.
Sea Island	96 ,, ,, ,, ,, ,,
Third Backcross	183 ,, ,, ,, ,, ,,
Montserrat S.I.	63 ,, ,, ,, ,, ,,

Thirty-eight single plant selections were made from the above strains; shedding of bolls was severe, and only a very small quantity of selfed seed was obtained. Lint from Kidney-Sea Island Third Backcross was considered far too harsh to justify further work on this strain, and most of the plants have now been dropped. It is thought that the harshness of the lint may be due to the use of the White Flower Sea Island in making the last cross. Two Backcross reselected plants were crossed again with Yellow Flower Sea Island this season.

In regard to cotton pests, tipworm was severe on all cottons, and in late-planted crops persisted till the end of the season. Jassid appeared early, taking a heavy toll of all cottons except Sea Island Bulk, which was grown on an isolated part of the Station. Cotton aphids were observed on all cottons and caused some injury, while harlequin bug and pink bollworm were present in small numbers. The cotton stainer has been absent from cotton for some years.

COTTON IN THE UNITED STATES.

45. American Cotton Acreage for 1943. (*Cotton*, M/c, 16/1/43.) United States farmers have been asked voluntarily to reduce cotton acreage in 1943 to 22,500,000 acres—this representing a reduction of about 1½ million acres below 1942, and it would be the smallest acreage since 1895. Because of the excess supply of short-staple and low-grade cotton, farmers normally producing short-staple varieties are urged whenever practicable to grow longer-staple cottons or to shift to other crops for which the war need is greater, such as peanuts, soybeans, and feed grains.

46. Cotton Industry in the United States. (*Cotton*, M/c, 29/8/42.) Dr. A. B. Cox, Director of the Texas University Bureau of Business Research, estimates that some 5,000,000 persons in the United States are employed in agriculture or industry or commerce dealing with cotton. Approximately 3,500,000 are employed in cotton production or in various kinds of cotton or cotton-seed manufacture, with perhaps another 1,500,000 engaged in distribution of these products or in service and manufacturing industries dependent upon the cotton industry.

47. American Cotton Handbook. By G. R. Merrill, A. R. Macormac and H. R. Mauersberger. (American Cotton Handbook Co., New York, 1941. Price in U.S. and Canada $4.80, in other countries $6.00. From *Bull. Imp. Inst.*, xl., 3, 1942, p. 206.) The object of this treatise is to give an account of the entire American cotton industry from the preparation of the soil to the marketing of the manufactured article. The three authors mentioned are responsible for the bulk of the work, but seven other experts have contributed chapters on their own special subjects; the book is therefore authoritative as well as complete. Its contents are divided into 23 chapters, dealing with such subjects as the historical background of the American cotton industry, the economic and statistical background; the cotton plant, its cultivation and varieties; ginning, classing and marketing; opening and picking operations; carding and combing; drawing and roving; spinning of cotton yarns; winding and twisting; manufacture of sewing thread and handwork cottons; spooling, warping, and slashing; weaving and designing; manufacture of knitgoods; bleaching, mercerizing and dyeing; printing and dry finishing; manufacture of terry fabrics; physical and chemical testing; laundering of cotton materials. There is a list of books on cotton (unfortunately confined to those written in English), a glossary of cotton terms, and appendixes on the use of the statistical method in textile testing (Prof. E. R. Schwarz) and on the nomenclature of dyes. The book is well illustrated and forms an excellent up-to-date reference book for all interested in the cotton trade, whether as producers, consumers or students.

48. World Supply of American Cotton, 1942-43. (*Cotton*, M/c, 27/2/43.) The world's supply of American cotton for the present season is estimated at 23,765,000 bales, compared with 23,425,000 bales in 1941-42. If world consumption should attain 12,760,000 bales the world's carry-over of American cotton on July 31 next would be approximately 11,000,000 bales compared with 11,115,000 bales in the previous season. Farmers' complaints about the labour shortage in the South have apparently had the desired effect, as according to reports from Washington the difficulty of securing labour on farms is to be remedied by the mobilization of 3,000,000 civilian workers to meet the shortage.

49. American-Egyptian Cotton in 1942. (*Cotton*, M/c, 17/10/42.) Arizona is the principal producer of American-Egyptian cotton, but in recent years production has extended into Texas, New Mexico, and California. In 1940-41 the acreage and production of American-Egyptian cotton approximately doubled

and reached a level second only to the record established in 1920. Producers of the cotton were asked this spring (1942) to expand production to the limit of the seed supply, and by July 1 the acreage was 207,500 acres, a 51 per cent. increase over 1941 and a 202 per cent. increase over 1940.

50. UNITED STATES: CONSUMPTION OF AMERICAN-EGYPTIAN (S × P) COTTON. (*Cotton*, M/c, 27/3/43, p. 5.) The consumption is expected to total about 26,600 bales during the first half of the 1942-43 season, or about 36 per cent. more than in the same period last season. At the current rate, consumption for the 1942-43 season would exceed 55,000 bales, against 48,000 for 1941-42. The indicated supply of American-Egyptian cotton for the present season is about 110,000 bales. The grade of the 57,400 bales ginned up to mid-January, 1943, was considerably higher than that for last season, but the staple length was shorter.

51. COTTON RESEARCH IN THE UNITED STATES. American National Cotton Council and the Cotton Textile Institute. (*Cotton*, U.S., **106**, 1942, B51. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 607.) A programme of scientific and economic research for the American cotton industry. The former includes: (1) chemical and physical research; (2) contacts with other scientific agencies; (3) investigations; and (4) commercial development. Basic studies are being made of cotton lint, linters, oil, meal and hulls; the industry is kept informed of cotton projects in progress at government, industrial and educational laboratories; surveys are made of opportunities for increased consumption of cotton, and work is in progress on the development of new and improved products and techniques. Recent achievements include the development of improved tyre cords, a superior type of webbing, a substitute for hemp, a crease-resistant finish, special yarns and weaves, and fastness tests. The economic research section includes (1) a complete information service for collecting and maintaining all current cotton statistics, as well as a comprehensive cotton library, and (2) factual studies on subjects directly or indirectly affecting the cotton industry.

52. NEW TYPE OF AMERICAN COTTON B6. (*Cotton*, M/c, 10/10/42.) Dr. A. M. Harding, President of the University of Arkansas, recently announced the development of a new type of cotton especially suited to mechanical picking. The College of Agriculture has tested the new variety, and, due to the serious farm labour shortage brought on by the war, some of the seed will be released for planting next year. The new cotton, called " B6," was evolved from the Rowden variety which is popular with textile mills. It has staple more than an inch long, is characterized by bolls forming closely around the main stem, and is said to produce more than a bale to the acre. Tests show that the mechanical picker can get about 90 per cent. of the " B6 " cotton out of a field at one picking. As a result, it was estimated that costs would be lowered about one-third. This, it is stated, would make up for the lowering in grade caused by mechanical picking. Leaders of the Arkansas Farm Bureau and the Arkansas Farmers' Union stated that the new " B6 " cotton might revolutionize the South's economy. If mechanical picking became practicable, one farm family could handle seven to eight times the acreage of cotton per season as was possible before. This would reduce the number of persons needed to get in the crop. The cost of production could, it is said, be reduced by approximately 50 per cent., and the cotton harvesting season shortened by several weeks.

53. RAPPORT SUR UNE MISSION D'ÉTUDES EFFECTUÉE AUX ÉTATS-UNIS DU 5 AOUT AU 18 OCTOBRE, 1939. By A. Brixhe. (*Bull. Agr. du Congo Belge*, xxxiii., Mars-Juin, 1942, p. 9.) This is the continuation of a report (of which an earlier instalment—not received—appeared in the Bulletin for March-December, 1941) of a mission arranged by the Compagnie Cotonnière Congolaise for the study of

cotton production in the United States. This section deals with the following subjects: the certification of seed, the application of genetics, official and private selection services, the handling of seed for planting purposes, the objects of selection, and harvesting.

54. Cotton Bags for Packing Crops. (*Cotton*, M/c, 3/10/42.) With burlap supplies shrinking, demand in the United States for cotton bags to pack agricultural commodities has expanded appreciably, and indications are that a ready market will be found for the approximately billion and a half yards of cotton bagging that the industry is making under orders from the War Production Board, according to the U.S. Cotton Textile Institute. The purpose of the order directing mills to convert looms to cotton bagging was to offset the shortage resulting from the inability of importers to obtain supplies of the jute cloths from Calcutta. For most agricultural bags cotton and burlap are interchangeable. Preparations are being made for the packing of other crops in cotton containers, among them sugar, rice, wheat, corn and linseed, beans, starch and seeds.

55. Windowless Cotton Mill: Lighting and Ventilating. Macon Textiles Inc. (*Text. World*, **92**, 7, 1942, p. 72. From *Summ. Curr. Lit.*, xxii., **18**, 1942, p. 417.) An illustrated account of the lighting and air-conditioning systems installed in a new mill in Georgia, U.S.A., which has the weaving room underground and the spinning department as a one-storey, windowless building above it. Lighting is by lines of tubular fluorescent lamps, going the whole distance of the ceilings at right angles to the looms or spinning frames. The weaving room has a " false " ceiling 9 feet from the floor and suspended 7 feet below the floor of the spinning room. The ceiling is constructed of expanded metal carrying a 1 inch layer of plaster and finished with " Celotex " acoustical tiles. The space above the ceiling is occupied by the air ducts, power and lighting cables and sprinkler pipes, and the return air ducts have screens to collect lint and fly. The ceiling to the spinning room is of plywood fastened to the roof beams. The air-conditioning plant has automatic controls.

56. Alabama: Relation of Exchangeable Potassium in Alabama Soils to Needs of the Cotton Crop. By N. J. Volk. (*J. Amer. Soc. Agr.*, **34**, 2, 1942, p. 188. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 345.) From the combined results of numerous fertilizer tests, the author concludes that about 95 per cent. of all soils studied responded significantly to the first increment (25 lb. per acre of K_2O) of applied potash and about 40 to 50 per cent. responded significantly to the second increment. For soils of the same type containing less than about 200 lb. of exchangeable potash per acre, there is a general relationship between the total yield of seed cotton and the total exchangeable potash contained in the soil. Soils which contained over 200 lb. of exchangeable potash per acre, however, frequently responded to an application of potash. It is thought that predictions of the need of the cotton plant for a second increment of potash, based on a knowledge of the texture, series, and exchangeable potash content of the soils, will be unreliable in about 35 per cent. of the cases. It is believed that differences in response to like quantities of potash are caused by differences in soil characteristics which may greatly influence the yield of cotton, and if possible these should be taken into consideration in making fertilizer recommendations on the basis of soil analysis.

57. The Response to Magnesium of Six Different Crops on Sixteen Alabama Soils. By A. L. Sommer *et al.* (*Soil Sci. Soc. Amer. Proc.*, **5**, 1940. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 775.) Corn (vegetative stage only) responded least and crotalaria and peanuts (yield of nuts) most to magnesium sulphate in greenhouse tests. Cotton and crimson clover gave considerable response.

58. ARIZONA: EGYPTIAN-TYPE COTTON: PRODUCTION. By R. H. Peebles. (*U.S. Dpt. Agr., Circ. No.* 646, 1942. From *Summ. Curr. Lit.*, xxii., **22**, 1942, p. 522.) The supply of pure seed for the Pima crop in Arizona was comparatively easy until 1922 when Upland cotton was introduced into the same region. The ill-effects of the contamination of the Egyptian-type by Upland cotton are described and an account is given of measures (including " roguing ") taken to ensure the seed supply of the present varieties " S×P " and " Earlipima." Illustrations are given of plants, flowers, bolls, seeds and lint haloes of the Upland Acala and Egyptian-type cottons and their first-generation crosses.

59. IRRIGATION REQUIREMENTS OF COTTON ON CLAY LOAM SOILS IN THE SALT RIVER VALLEY. By K. Harris and R. S. Hawkins. (*Ariz. Sta. Bull.*, 181, 1942. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 509.) Cotton of the Pima (American-Egyptian) and Acala varieties was grown during 1935-40 under several irrigation schedules on clay loam soils of the Laveen series on the Mesa experiment farm. Plants receiving an early irrigation after planting were stimulated into rapid and extensive growth before heavy flowering, and consistently outyielded those not irrigated after planting until they reached the wilting point. Subsequent irrigations were given at the same soil moisture levels. In general, the higher final yields followed the more rapid growth before heavy fruiting. Early irrigation encouraged early fruiting, as was shown by the greater percentage of the total crop harvested at the first picking. Similarity in root development was indicated by water absorption from depths of from 2 to 6 feet in August-October. Excessive vegetative growth during fruiting, even though the plants had been stimulated into rapid growth before fruiting, could be prevented largely by regulation of irrigation. Plants making quickest growth from planting to July 31 and continuing growth at a moderate to low rate from July 31 to September 10 gave the best yields. Cotton plants evidently should be allowed to reduce available soil moisture more completely between irrigations during fruiting than prior to this period, unless stressed too severely before fruiting. Detrimental effects of puddling of the soil during seedbed preparation might persist throughout the entire season. Cotton provided with limited soil moisture during fruiting had a higher ginning percentage than that given abundant soil moisture during this period.

60. LOUISIANA: COTTON MARKETING PRACTICES IN SELECTED LOCAL MARKETS. By H. W. Little and R. A. Ballinger. (*La. Sta. Bull.*, 345, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 121.) Information related to the 1940-41 cotton marketing season was collected by personal interviews from 184 cotton growers and 52 cotton buyers in 8 markets in the northern and central parts of the State. The average production of cotton per grower, the market outlets used by growers, their knowledge of quality and market conditions, and the practices of local cotton buyers are analysed and discussed. Some of the findings and conclusions were that " 30 per cent. of the producers had no knowledge of the quality of their cotton when they sold it, and another 25 per cent. knew only what the buyer told them concerning the grade and staple length of their bales. . . . While nearly one-half of the producers had available current information concerning the price of futures and the spot prices of middling 15/16 inch cotton, only 7 per cent. had access to information regarding premiums and discounts for various grades and staple lengths." Nearly 50 per cent. of the total volume of purchases in the local markets studied were made by independent buyers, over 40 per cent. by salaried buyers, and about 10 per cent. by persons buying on commission. " Practically all buyers at least made an attempt to determine the grade and staple length of a bale of cotton before purchasing it. However, it seems probable that a considerable proportion were not able to do this very

accurately. About three out of every five local buyers interviewed had no means of checking their work against official grade standards or staple types. Most of the other buyers had access to the standards for only a few of the more common grades and staple lengths."

61. MISSISSIPPI: COTTONSEED TREATMENT. By J. A. Pinckard. (*Circ.* 103. *Miss. Agr. Exp. Sta.*, 1942.) Discusses briefly cottonseed treatment in the State, materials recommended and their methods of use and costs, storage of treated seed, and precautions to be taken when treating seed with chemicals.

62. FIELD CROPS EXPERIMENTS, 1941. (*54th Ann. Rpt. Miss. Exp. Sta.*, 1941. Received 1942.) Work on cotton included varietal trials, cultivation experiments, cotton disease investigations, rotation experiments, and the uses of cottonseed.

63. COTTON CHOPPING. (*54th Ann. Rpt. Miss. Exp. Sta.*, 1941, p. 47.) Cotton chopped with the mechanical chopper cost an average of $0.25 per acre with an additional hand-hoeing cost of $1.70 per acre, and yielded 1,906 lb. seed cotton per acre. Hand-chopped cotton cost $1.04 per acre with an additional hoe cost of $1.75, and yielded 2,074 lb. seed cotton per acre. The ability to get cotton chopped at an earlier date with the mechanical chopper and during periods of scarce and high-priced farm labour seems worth consideration.

Cotton Picking.—From 21 varieties of cotton used for testing the mechanical cotton picker, the machine picked from 85·6 to 94·8 per cent. of the cotton, knocked from 2·1 to 6·3 per cent. to the ground, and left from 1·8 to 8·8 per cent. on the stalks. The picker reduced the amount of moisture in most varieties 1 to 2 per cent., but the cotton graded from 0·7 of a grade to 2 grades lower.

64. FERTILIZERS OTHER THAN NITROGEN FOR COTTON IN THE DELTA. By R. Kuykendall. (*Miss. Farm Res.*, **5**, 7, 1942. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 774.) The development of fertilizer use and response under Delta soil conditions in Mississippi is discussed. Based on tests from various areas, it has been found that there are conditions under which phosphorus and potash are needed for maximum crop production.

65. WEED CONTROL AND COTTON TILLAGE ON BLACKBELT (PRAIRIE) SOILS. By T. N. Jones *et al.* (*Tech. Bull.* 29. Miss. Agr. Exp. Sta., 1941. Received 1942.) The purposes of this study were: to determine the most efficient and economical method of seedbed preparation and cultivation for cotton production and weed control; to correlate the physical conditions of the soil with machine operations as influencing cotton production and weed control; to determine the effect of different methods of seedbed preparation and cultivation on the cotton root system. The following is a summary of the results. Fall and winter preparations produced highest yields. Deep preparation produced slightly higher yields than shallow preparation. Methods recommended: (*a*) plough in the fall or winter and bed in the spring with a breaker; (*b*) if prepared in the spring, bed with two operations of the breaker or its equivalent. Preparation has more effect on yields than cultivation. Cotton must be cultivated in order to control weeds. Cultivation may be done most efficiently about every 10 or 12 days, ending between July 1 and July 10, and using methods and implements that will control weeds with minimum injury to the cotton plants. With shallow seedbed preparation cultivation should be shallow, especially after plants are 6-8 inches tall, to avoid injury to the roots; with deep seedbed preparation deeper cultivation can be practised.

66. NEW MEXICO: FIELD CROPS INVESTIGATIONS, 1941. (*New Mexico Sta. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 366.) Cotton work included varietal trials, breeding work, fertilizer experiments, seed treatment and irrigation tests, tests of different forms of sulphur, crop sequences with cotton, effects of different irrigation treatments on maturity, lint, and yield factors of Acala cotton.

67. COTTONSEED TREATMENTS. By G. Staten. (*New Mexico Sta. Bull.*, 290, 1942. From *Exp. Sta. Rec.*, **87**, 5, 1942, p. 683.) Tests with acid-delinted and undelinted cottonseed and the effects of various dust treatments on them are reported. Significant correlations of percentages of floating seed and of germination were found, but some types of immature seed could not be removed by cleaning. Considerable improvement in the germinability of low-quality seed by cleaning was noted, but little improvement in that of good quality seed could be expected. Normal dosages of several commonly used dust treatments, including New Improved Ceresan, 2 per cent. Ceresan, and Spergon were found to decrease the rate of germination slightly. Overdosages of the first delayed germination seriously, and toxic effects on seedlings were noted. Dust-treated seed was held under three different storage conditions for over a year without injury to germinability. New Improved Ceresan and 2 per cent. Ceresan gave excellent protection against seed rotting in cold soils for both delinted and undelinted seed, and Spergon was almost as good as either of these treatments. Sanoseed and Cuprocide afforded some protection but were comparatively ineffective. No difference was found in the ability of acid-delinted and undelinted seed to resist rotting in cold soil. Spergon, New Improved Ceresan, and 2 per cent. Ceresan, in the order named, proved effective in increasing seedling emergence, preventing pre-emergence damping-off, increasing survival stands, reducing post-emergence damping-off in some cases, and increasing survival stands of healthy plants in soils infested with *Rhizoctonia*. Cuprocide and Sanoseed were ineffective, and none of the treatments was very satisfactory in preventing infection after emergence of the seedlings. In field-plot trials acid-delinted seed produced slightly (not significantly) higher yields than undelinted seed. Both New Improved Ceresan and 2 per cent. Ceresan were effective in increasing the survival stand of plants in the field but did not significantly increase the yield of a full field stand. Use of a good dust treatment is recommended regardless of whether delinted or undelinted seed is planted. Some of the dusts are toxic to man, so care should be used to prevent inhaling or allowing them contact in quantities with the skin.

68. NORTH CAROLINA: COTTON RESEARCH, 1939-40. (*N. C. Rpt. Agr. Exp. Sta.*, 1940. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 18.) A new strain of Mexican cotton has been produced; it is earlier, more productive and makes a smaller growth than the parent variety and has a staple length of 1 inch or over. Certain hybrids and selections from other varieties are also promising. Clevewilt, Coker 4 in 1, Dixie Triumph and Wannamaker Early Wilt are good wilt-resistant varieties.

69. OKLAHOMA: COTTON VARIETY TESTS IN 1941. By H. E. Dunlavy *et al.* (*Oklh. Sta. Misc. Publn.*, 4, 1942. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 369.) Continued co-operative varietal studies with cotton indicated that several strains of Nucala (Acala 5) are promising for profitable production in most sections of south-western Oklahoma, and that Deltapine, Oklahoma Triumph, Stoneville, and Rowden variety groups are well adapted to central and eastern Oklahoma. In all three sections Hi-Bred is a high-yielding cotton with a very short staple. The results of six variety and strain tests conducted in 1941 are tabulated.

70. COTTON IN WAR TIME. By K. C. Davis and W. A. Williams. (*Curr. Farm Econ.*, Ser. 49, vol. xv., 4. Okla. Agr. Exp. Sta., 1942.) A comparison of Oklahoma production and military requirements. It is stated that at present there is a so-called surplus in the United States of some ten million bales of cotton, but most of this is short staple or low grade, or both, and under existing conditions cannot be used in America. Therefore, the United States has a surplus of cotton and at the same time a shortage of *usable* types. From the standpoint of profit and also of patriotism, the Oklahoma farmer must not add to this stock of unusable cotton, but must produce the middle staple length cottons with grades as high as possible which can go into domestic consumption.

71. TENNESSEE: FIELD CROPS EXPERIMENTS, 1940. (*Tenn. Sta. Rpt.*, 1940. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 367.) Work on cotton included breeding experiments, varietal trials, research on technique, devices for measuring length and fineness of cotton fibre, and the relation of yarn structure to yarn strength.

72. TEXAS: FIELD CROPS EXPERIMENTS IN 1941. (*54th Ann. Rpt. Agr. Exp. Sta.*, 1941. Received December, 1942.) Work in connection with cotton included varietal trials, breeding and selection work, fertilizer experiments, rotation experiments, and investigations on the control of pests and diseases.

73. COTTON FERTILIZER EXPERIMENTS, 1941. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941.) In fertilizer experiments at College Station the unfertilized soil produced 143 lb. lint cotton per acre compared with 276 lb. for the soil that received 400 lb. of a 6-12-4 fertilizer. Experiments over 15 years indicated that the soil, Lufkin fine sandy loam, responds to applications of nitrogen, phosphoric acid, and potash, and that a 4-12-4 fertilizer at the rate of 400 lb. per acre has given good results. In soil building studies carried out at the Temple Sub-Station it was found that Hubam clover and selected strains of cow-peas offered the best possibilities for soil-building purposes. In 1941 cotton after cotton yielded 540 lb. seed cotton per acre. However, cotton after Hubam, which was harvested for seed, gave a yield of 1,110 lb. seed cotton per acre, an increase of slightly more than 100 per cent. On this same area, root rot was reduced from 71 to 15 per cent. Cotton after Hubam, harvested for hay (with second growth turned under for green manure), gave a yield of 1,015 lb. seed cotton per acre. At Nagodoches Station Coker 4-in-1 str. 4 produced a 3-year average of 462 lb. of lint per acre in sandy soil abundantly infested with the wilt parasite. The staple length averaged $1\frac{1}{16}$ inch. In sandy soil that is abundantly infested with root-knot nematodes and the wilt parasite, the plants showed minimum injury by root-knot and only 0·3 per cent. of them wilted, while 72 per cent. of the Mebane cotton wilted in adjacent rows. Coker 4-in-1 and Coker 100 W.R. str. 39S include strong resistance to the combination of wilt and root-knot, with other superior agronomic qualities, and are promising strains for East Texas.

74. BREEDING COTTON FOR MECHANICAL HARVESTING. By D. T. Killough *et al.* (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 11.) " In the breeding work to combine in synthetic types those characteristics found to be best suited to mechanical harvesting, the coarser-bodied, medium-staple varieties such as Gorham's Lone Star, Western Mebane 140, Western Early, and Mebane 804-50 were used as parents. In cleaning mechanically-harvested varieties and hybrid strains prior to ginning, it was found that the coarser-bodied, medium-staple types with compact locks and fibres dense on the seed graded from one to three commercial grades higher than the softer-finer-bodied, longer-staple types, representing an increase in value of $3·10 a bale. In order to further increase the yield of the present hybrid strains these have been crossed with two new high-yielding varieties, Deltapine 14 (44-51) and Half-and-Half Selection 25. Four of the hybrid strains, Gorham's Lone Star × Deltapine 112, Mebane 140 × Ducona 30-31, Western Early × Ducona 17 strain 1, and Western Early × Ducona 17 strain 10, gave yields 11, 12, 15 and 24 per cent. higher, respectively, than the average yield of the selected high-yielding commercial varieties used as standards or checks."

COTTON IN EGYPT.

75. EGYPT: COTTON INDUSTRY, 1942-43. (*Man. Guar.*, 8/12/42.) This season cotton plantings have been reduced drastically, and cultivators have no doubt concentrated on the highest-yielding tracts, while the supply of fertilizers has been spread over a smaller area. Production is estimated to reach 3,754,000 kantars, consisting of 785,000 kantars of Giza 7, 1,127,000 of other long-stapled

varieties, 34,000 of medium staples, and 1,808,000 kantars of the shorter staples. Giza 7 thus accounts for only 41 per cent. of the long-stapled crop, compared with 64 per cent. last season, and apparently the Egyptian authorities and farmers are paying greater attention to some of the newer long-stapled cottons.

76. EGYPTIAN COTTON. (*Cotton*, M/c, 20/3/43.) Introducing the 1943-44 Budget on March 16, the Egyptian Finance Minister said: "We have balanced the Budget without touching reserves. Our prosperity is due to influx of money into the country from abroad and money spent here by Allied troops." The Minister said the price of Egyptian cotton was formerly lower than that of American cotton, but since the Government offered to buy the crop at a minimum price the situation was reversed. Sakellaridis, Giza 7, and Ashmouni were now higher than the corresponding grades of American cotton. Cotton now offered to the Government was very small in quantity, as it fetched higher prices on the open market.

77. EGYPTIAN COTTONS. (*Man. Guar.*, 13/3/43.) Reports recently received from Egypt are to the effect that Karnak—formerly known as Giza 29—is now coming into full production, and that the increase in the acreage planted to this variety has been achieved mainly at the expense of Giza 7. As a fairly large crop of Malaki—formerly known as Giza 26—has also been grown, and a new high-quality cotton, Giza 39, is being developed, it seems clear that the better range of Egyptian cottons will be well cared for in the near future. This may cause some difficulty for users of Giza 7, who need it for the lower range of counts, and may not be prepared to use a cotton as good or as expensive as Karnak. Such spinners may find that a further new type is worth their attention; this is Giza 36, officially described as a medium-staple cotton. The use of this description for this cotton indicates the strength of the tendency for the general run of the qualities grown in Egypt to improve. Giza 36 is both longer and spins a stronger yarn than Giza 7, which has generally been considered as a long-staple cotton.

From the agricultural point of view, as distinct from the textile one, Giza 36 has perhaps more in common with Ashmouni and Zagora than with the older long-stapled varieties. For one thing, it appears to grow best in the southern Delta region, where the principal variety cultivated has recently been Zagora. The agricultural qualities of the new Giza type are remarkable, its yield per acre, ginning outturn, and earliness of maturity all being excellent, and in any circumstances these would have stimulated a rapid increase in its cultivation, but a further influence in the same direction was provided by the Egyptian Government when it decided to prohibit the growing of Zagora this year. It is expected that the seed available for this year will be enough to plant some 20,000 or 25,000 feddans with Giza 36, while for 1944 a further big increase is expected, with keen competition between this strain and Karnak.

The agricultural authorities in Egypt are not losing sight of the possibility that a demand may arise for a still cheaper Egyptian type of good staple. The search is being continued for a suitable type falling between Ashmouni and Giza 7 as regards length of staple, but with such a heavy yield that it could be sold at much the same price as Ashmouni.

COTTON IN OTHER FOREIGN COUNTRIES.

78. ARGENTINE COTTON SEED: QUALITY CONTROL. By N. Reichart. (*Bol. Mens.* 81-82, Junta Nac. del Algodon, Buenos Aires, 1942. From *J. Text. Inst.*, November, 1942, A493.) Measures for the improvement of cottonseed for sowing in the Argentine Republic are mentioned and charts are given showing quantities of authorized and certificated seed for sowing produced in the various regions in the 1940-41 season, and the classification of the seed according to germinating

power. The average germinating power of authorized seed was 72·33 per cent. In Resistencia 43·68 per cent. of the certificated seed produced had a germinating power of over 90 per cent.

79. Cotton Cultivation in Santiago del Estero Province. By A. O. Castro. (*Bol. Mens. Junta Nac. del Algodon*, No. 78. Buenos Aires, 1941, p. 802. From *Summ. Curr. Lit.*, xxii., **6**, 1942, p. 131.) The possibilities of developing cotton cultivation in the province of Santiago del Estero are discussed. The climate and soil are particularly suitable and irrigation systems are being developed. Yields are high, and even in 1937, when this district experienced a severe drought, amounted to 126 kg. of fibre per hectare, compared with 88 kg. in the Chaco and 140 kg. in Corrientes. The cotton is superior in whiteness, length and strength to that produced in other parts of the country. The variety Acala (Blue Tag) is the most suitable for the Santiago region. At present the poor cultivators are dependent on dealers from whom they too frequently receive unfair treatment, and the formation of co-operatives and improvements in the method of subdivision of the land are needed. Education of growers in methods of cultivation and precautions to be taken in harvesting will be necessary.

80. Cotton in Tucuman. By W. E. Cross. (*Mem. An. del año* 1941. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 21.) A number of crosses have been made between local and imported cottons. Selections of Tucuman C1 and of Lightning Express have proved promising. Studies of mutations, both natural and colchicine-induced, are in progress.

81. Boletin Mensual. (Min. de Agr., Junta Nac. del Algodon, Buenos Aires, 1942.) *Bulls.* 85-6, 87-8, 89-90, 1942, contain the following among other papers in Spanish: "Fixing of maximum prices for cotton spinning"; "The adoption of a standard for cottonseed destined for the industry"; "The moisture content of cottonseed in relation to its germinative capacity and the presence of *Aspergillus wentii*" (M. Di Fonzo); "Textiles consumption in the United States in 1941"; "The establishment of a cotton spinning and weaving factory in Santiago del Estero approved by Congress"; "Activity of cotton-spinning mills in Argentina in 1941 and their consumption of raw cotton"; "Maximum prices provisionally fixed for various types of cotton yarn"; "The industrial uses of cottonseed in 1941"; "Study of the chemical composition of cottonseed and of cottonseed cake" (E. F. Paulsen); "The multiple uses of cotton." Statistics are also included of acreage, production, prices, exports, etc.

82. Brazil: Cotton Production, 1941-42. (*Bd. of Tr. J.*, 28/11/42.) According to statistics recently published by the Bank of London and South America, Ltd., in London, Brazil ranked as the world's fourth largest cotton producer for the 1941-42 season with 2,034,000 bales out of a total world production of 26,087,000 bales. Production in the other five principal countries was as follows: United States, 10,599,000 bales; India, 4,640,000; Soviet Union, 3,000,000; Egypt, 1,650,000; and China, 1,000,000.

83. Brazilian Cotton. (*Cotton*, M/c, 23/1/43.) Reports from Rio de Janeiro, dated November 6, 1942, state that cotton prices have been firmer during the past quarter due to the expectation of smaller crops as a result of adverse weather, and current quotations are on an average about 40 per cent. higher than those ruling at this time last year. The outlook appears slightly more favourable owing to the substantial volume of exports going to Spain, Great Britain, and Sweden, and the increased consumption of the Brazilian mills. Despite the reduction of 43 per cent. in exports of Paulista cotton during January-September, 1942, compared with the like period of last year, it is anticipated that distribution to all markets will reach a total of 245,000 metric tons this season (out of a total Paulista crop of some 295,000 tons), leaving a possible stock of 140,000 tons to be

carried forward to the next season. The latest official estimate of the crop in the Northern States of Brazil is 85,000 tons, compared with the last estimate of 106,000 tons for the 1941-42 season. This substantial reduction in the crop is reported to be seriously affecting conditions in the interior of the States concerned, and in consequence large numbers of workers are migrating to the Amazon regions to gather rubber. It is reported that the Department of Agriculture in the State of Parahyba has been experimenting with a very long staple cotton said to be almost equivalent to the best Egyptian.

84. DIE KULTUR DER BAUMWOLLE IN BRASILIEN. By E. Morgenroth. (*Forschungsdienst*, **13**, 1942, p. 341. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 55.) In São Paulo 4 varieties are cultivated, all selections from the Upland varieties Texas Big Boll and Express. In the north-east the perennial variety Moco, with lint length of 35-45 mm., is grown. Seed production is exclusively in the hands of the State. The various cotton pests in Brazil are discussed.

85. TEXTILE FIBRES: PRODUCTION IN BRAZIL, AND THEIR USES. By C. E. Nabuco de Araujo, Jr. (*Chem. and Eng. News*, **20**, 1942, p. 1296. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 581.) Cotton production in Brazil increased from an average of 119,000 tons annually in the period 1925-29 to 521,600 tons in 1941. Rayon production increased from 32 tons in 1926 to 8,000 tons in 1941. Various fibres, such as piaçava, caroá, tucum, curauá, paco-paco, etc., are produced in Brazil and have been shown to be useful for many industrial purposes. The cultivation of ramie, jutè and sisal has recently been started in the country. A table showing the botanical names and properties of the native fibres is given. Brazil is exporting to other South American countries not only raw fibres but also fabrics produced locally, as well as some cloths in which caroá and other native fibres are mixed with cotton.

86. CHINA: GOVERNMENT'S PLAN TO STABILIZE THE PRICE OF COTTON. (*Cotton*, M/c, 27/3/43.) The Ministry of Economic Affairs at Chungking recently announced a plan to purchase about 84,000 bales of cotton in two unoccupied Provinces (Shensi and Honan) in North China. This cotton will be manufactured by cotton mills operating on a contract basis, and the finished goods are to be sold by the Government to consumers at less than current market prices. This is part of a Government project to provide adequate supplies of necessities to Government employees and needy civilians. The programme is designed to curb rapidly rising prices for cotton goods and other necessities. Previous reports placed the Free China cotton crop in 1941 at around 1,200,000 bales. Cotton mills in Free China are believed to be operating approximately 260,000 spindles.

87. PARAGUAY: COTTON INDUSTRY, 1942. (*Cotton*, M/c, 20/2/43.) The crop amounted to some 31,912 bales. Consumption by the Paraguayan mills has steadily increased during the last few years. After a seed reserve of about 1,200 metric tons was set aside, 11,500 tons of cottonseed remained for crushing, the yield of cottonseed oil being estimated at 1,265 tons. Cottonseed oil and peanut oil have maintained a prompt and ready sale in Paraguay for the last eighteen months, and a mixture of the two is sold for cooking and other purposes.

88. PERU: COTTON CROP, 1942-43. (*Cotton*, M/c, 27/3/43.) Reports from Peru state that abnormally low temperatures and unsuitable soil conditions delayed cotton planting, and replanting was necessary, in some cases as many as three times. By decree of November 21 last, the Ministry of Agriculture is authorized to establish an office to supervise the 30 per cent. acreage reduction programme instituted on July 24, 1942.

89. PERU: MEMORIA ANUAL DE 1940 DEL JEFE DEL DEPARTAMENTO DE INVESTIGACIONES DE ALGODON Y CEREALES. By T. Boza Barducci *et al.* (*Est. Exp. Agr. de la Molina*, Lima, Peru. In Spanish with English summary.

Received 1942.) *Cotton :* Results of selection work carried out during 1939-40 are reported and show by means of tables and diagrams the progress achieved in connection with the work on the improvement of the most important Tanguis cotton characters, and on the increasing resistance of Tanguis to *Verticillium* wilt. The origin of strain LM No. 7-35—actually being multiplied—is explained, and its principal characters described. In cotton growers' opinion this strain is much earlier, higher yielding, and of better quality lint, which fetches higher premiums on the market, than ordinary Tanguis. The characters of strains CN-LM, C-LM, CB-LM and P-LM are noted, and since type CN-LM is outstanding all future work will be carried out with it. Interlinear, intervarietal and interspecific crosses are next described, the object being to combine certain Egyptian cotton characters, and especially its scant vegetative and radicular growth, with lint characters from Tanguis cottons, in a type which would be suitable for cultivation in the Northern Peruvian coastal region. Special mention is made of the value of certain Tanguis × Sakel crosses now in F_6, the lint of which, in the opinion of experts, would command high premiums. Work is discussed in connection with: Determination of the chromosome numbers of the species *G. Raimondii* Ulbr. and its hybrids with 13 and 26 chromosome species; production of cotton mutants by colchicine; cytogenetical investigation of a cotton species from Tumbes. Reference is also made to experiments on (*a*) Percentage of humidity in seed cotton during the picking season, with the aim of introducing mechanical drying systems in Peru for improving ginning; (*b*) Pre-treatment of cottonseed; (*c*) Soil temperatures during the growing season with reference to wilt attack, and to root development in relation to resistance to this disease; (*d*) Disease and pest resistance of the wild and cultivated cotton plants in the Type Collection of 442 specimens.

[*Cf.* Abstr. **487**, Vol. XVIII. of this Review.]

SOILS, SOIL EROSION, AND MANURES.

90. The Ideal Soil. (*Nature*, CL. 3792, 1942. Abstr. in *Trop. Agr.*, xix., **12**, 1942, p. 244.) In a paper by Dr. Hugh Nicol the ideal soil is said to be composed not of discrete mineral grains but of crumbs or aggregates. These include colloidal matter of two kinds—mineral colloids and organic colloids. The latter may be partly humus, which may be regarded as an *end-product* of the microbial decomposition of organic matter. In a fertile soil, the organic matter includes a sticky material less inert than humus, and resulting from the recent decomposition of organic matter. This organic cement sticks the grains together into small crumbs which have the most desirable physical properties. It is not the microbes which are important in soil, but the products of their recent activity are important. There is reason to believe that the plant and the soil with which it is in contact form a practical continuum, this contention gaining weight from the work by H. Jenny and R. Overstreet on ionic exchange. If plants are grown in mixtures of sand and calcium clay, the roots accumulate calcium ions, whereas the clay particles gain in adsorbed hydrogen ions. Contact exchange is postulated to take place only when the (cation) oscillation spaces of particles overlap; the particles may be both clay, or one may be a root surface, both being negatively charged. Contact intake is difficult to investigate on account of a presumed high gradient of carbon dioxide in the neighbourhood of a root, but there is very suggestive evidence of a contact depletion, so that the theory of contact exchange of ions may be regarded as having made a promising beginning. There is yet no evidence for contact exchange of anions. No contact jumping of cations could be found between roots and positive iron hydroxide sol.

91. Soil Organic Matter: Its Nature and Importance. By S. A. Waksman *et al.* (*New Jersey Sta. Circ.*, 422, 1942. From *Exp. Sta. Rec.*, **87**, 4, 1942,

p. 483.) A popular treatment of the practical aspects of the subject, mostly in the form of questions and answers.

92. OBSERVATIONS ON SOIL METHODS—PART II. By W. J. Blackie and A. I. Biggs. (*Agr. J. Dpt. Agr. Fiji*, xiii., **3**, 1942, p. 83.) Observations are recorded in connection with recent methods for the determination of phosphorus and potassium in soils, and descriptions are given of reliable techniques using hydrochloric acid extracts of tropical soils.

93. SOLUBLE MATERIAL OF SOILS IN RELATION TO THEIR CLASSIFICATION AND GENERAL FERTILITY. By M. S. Anderson *et al.* (*U.S. Dpt. Agr. Tech. Bull.* 813, 1942. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 770.) The studies reported include comparisons of soil solutions variously prepared from representative series of some of the important great soil groups and of base-exchange relationships of these same soils. Data upon the relation between soil solutions and plant response to alteration of the water-soluble components, after alteration of important soil types has taken place through cultural practice, are also presented. Following an outline of the plan of work, the bulletin gives a description of the virgin soils studied and takes up factors affecting solubility of virgin soils, electrical-conductivity measurements, chemical composition of soil solutions variously prepared from virgin soils, soluble material in relation to depth in a soil profile, interrelationships of constituents, soluble material in cultivated soils in relation to crop growth, relation between total chemical composition of soil and the water solution, and soil solution as a medium for plant growth. Soils of the Podzol, Chernozem, Prairie, Gray-Brown Podzolic, Lateritic, and Red Podzolic groups were investigated and are reported upon in detail both qualitatively and in terms of tabulated numerical data.

94. A MEDIUM FOR THE RAPID CULTIVATION OF SOIL ACTINOMYCETES. By E. J. Bottcher and H. J. Conn. (*J. Bact.*, xliv., **1**, 1942, p. 136. From *Rev. App. Mycol.*, xxi., **11**, 1942, p. 502.) At the New York (Geneva) Agricultural Experiment Station the authors have obtained rapid growth of eleven cultures of soil Actinomycetes on a medium consisting of cotton soaked in 5 ml. glycerol, 2 gm. yeast extract, 1 gm. potassium nitrate, and 1,000 ml. water.

95. THE OCCURRENCE OF BACTERIOSTATIC AND BACTERICIDAL SUBSTANCES IN THE SOIL. By S. A. Waksman and H. B. Woodruff. (*Soil Sci.*, **53**, 3, 1942, p. 233. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 486.) Summarizing the results of various studies in this field (20 references), it has been found possible, using proper extracting agents (ether), to demonstrate that soils contain substances of the actinomycin type which inhibit growth of certain bacteria in culture media. These substances when isolated from the soil have not only a bacteriostatic but also a bactericidal action on certain bacteria. Added to the soil in concentrations much higher than would be necessary to inhibit bacteria in artificial media, actinomycin is rendered ineffective against these bacteria. Soils, peats, and composts contain a substance (*a*-humus) that reduces considerably the activity of actinomycin, even in artificial media.

96. THE USE OF THE MICROMETRIC AND OTHER METHODS FOR THE EVALUATION OF SOIL STRUCTURE. By C. L. W. Swanson and J. B. Peterson. (*Soil Sci.*, **53**, 3, 1942, p. 173. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 333.) The authors describe a micrometric method for the measurement of pore spaces in thin sections of soil. Projection of the microscopic images (174X) on a graduated scale facilitates the measurement of the pore spaces. For section cutting, the soil was embedded in synthetic resin media. The micrometric method of determining pore space was compared with a moisture-tension method which yielded pore space values comparable to those obtained by the micrometric method for a cultivated and a virgin soil. A modified Coile volume-weight

sampling tube was used for obtaining undisturbed cores of soil samples for the determination of capillary and non-capillary porosity. It appeared that on wetting, the size of the pores was reduced by the swelling of the soil, and that this swelling effect was least in the larger pores. When the pore space relationships of a cultivated and a virgin surface soil horizon of Marshall silt loam soil were studied, the results showed that, for the range (0·0117-1·17 mm. diameter) of pore sizes measured, the virgin soil had twice the volume of pores and a higher percentage of large pores than did the cultivated soil. An advantage of the microscopic study of soil pore space and structure in thin sections of undisturbed soil was found in the fact that not only quantitative but qualitative observations can be made of such properties as distribution, sizes, volume, and shapes of pores. The direct observation of the true structural pattern of the soil often yields information necessary for the correct appraisal of the relationships between soil structure and such other natural phenomena as infiltration capacity and soil pore space. Combined with soil moisture studies it provides additional means for the interpretation and understanding of natural soil processes.

97. THE DETERMINATION OF SELECTED CHEMICAL CHARACTERISTICS OF SOIL WHICH AFFECT THE GROWTH AND COMPOSITION OF PLANTS. By G. R. Noggle and F. L. Wynd. (*Pl. Phys.*, **16**, 1, 1941, p. 39. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 478.) The authors offer a systematized and rather complete compilation of methods for the sampling, the chemical analysis, and the physical examination of soils, and the calculation of the results in terms of the constituents, properties, and relationships affecting the physiology of the plant. Volume weight rather than an arbitrary assumption of the weight of an acre-foot of soil is taken as the basis for expressing analytical data in terms of pounds to the acre. Under the heading of water relationships are given methods for moisture and water-holding capacity determinations and for calculating the percentage of the water-holding capacity under field conditions. Under the heading of acidity relationships, *p*H and lime requirement are to be determined. Colloidal relationships measured include total base exchange capacity, total replaceable bases, percentage base saturation, replaceable hydrogen, individual replaceable bases, exchangeable hydrogen by titration (based in part on Parker's method), and organic colloid base exchange capacity (Olson and Bray's procedure). The nitrogen determinations included total nitrogen, ammonia, nitrate, and organic nitrogen. Systematic separations of the important elements in water extracts and in dilute acid extracts are also provided for, and under the general head of carbon are grouped methods for determining carbonates, organic carbon by combustion and by Walkley and Black procedure, and loss on ignition. Analytical methods recommended for examination of the extracts included a volumetric method for determining potassium as cobaltinitrite, essentially that of Wilcox, and two gravimetric methods—a method based on Kolthoff's zinc uranyl acetate reagent for sodium determination and a modification of the Denigès colorimetric method for phosphates.

98. A RAPID METHOD FOR DETERMINING SOIL MOISTURE. By J. S. Papadakis. (*Soil Sci.*, **51**, 4, 1941, p. 279. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 732.) Place 50 gm. of soil in a flask marked at about 100 c.c. Add tap water, shaking at the same time in order to eliminate soil air. Make up to the volume and weigh. Subtract from this weight that of the flask made up to the same volume with water alone. The oven-dry weight of the soil is the difference multiplied by a factor determined once for each kind of soil by oven drying a sample and dividing the oven-dry weight by the aforementioned difference. The factor varied from 1·563 to 1·667 for 17 soils tested.

99. A FIXATION METHOD FOR DETERMINING THE PHOSPHORUS AND POTASSIUM REQUIREMENTS OF SOILS. By E. R. Purvis and J. M. Blume. (*Soil Sci. Soc.*

Amer. Proc., 5, 1940. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 774.) Laboratory and field data show the relationship existing between the amount of phosphorus and potassium absorbed by a soil from a standard solution and the response of various crops to fertilization of the soil with these elements. An absorption method for determining the phosphorus and potassium requirements of soil is described.

100. PROSPECTS FOR SOIL CONSERVATION. By G. V. Jacks. (*E. Afr. Agr. J.*, October, 1942, p. 73.) The world has awakened during the last few years to the dangers threatening it from soil exhaustion caused by short-sighted methods of agriculture, and in this article by the Deputy Director of the Imperial Bureau of Soil Science, Rothamsted Experimental Station, the whole matter is described with a freedom from technicalities that will make it intelligible to every reader. During the last century wherever new land has been opened up for settlement there have been practised kinds of agriculture which have resulted in a rapid depletion of the natural fertility of the soil. The first symptoms are failing yields, but a later and quite unexpected phase of soil exhaustion has been the more or less complete disappearance of the soil itself. A fertile soil, wherever it is formed, has many of the properties of a sponge—it can absorb quantities of water, and possesses considerable internal cohesion. An infertile and exhausted soil loses this water-absorbing capacity and cohesiveness, and breaks down to a mass of separate particles, in which condition it is readily washed away by water or blown away by wind. In this way, as a result of the depletion of a mere fraction of the total soil fertility, enormous areas mainly in North America, Africa, and Australia have been denuded of soil and are now to all intents and purposes barren wastes. The current wastage of land through this so-called soil erosion is not immediately serious for the world as a whole, since there is still plenty of good land available for everyone, but it is becoming serious in the United States and in territories in South and East Africa. Summary figures of a national survey made in the United States in 1934 illustrate the extent of the damage done by soil erosion mainly within the past forty years. Of the total land area 14 per cent. had lost three-quarters to all of the soil, 42 per cent. one-quarter to three-quarters, and 30 per cent. (much of it unsuitable for agriculture) was uneroded. Apart from the loss of productive soil, incalculable damage has been done by chronic flooding of the main rivers, progressive desiccation of the land, and the profound disturbances to the normal régime of ground waters that are produced by the disappearance of the absorbent surface soil, and adversely affect agriculture even where no erosion has occurred. The cause of soil erosion is often given as the destruction of the natural vegetation which normally affords the soil adequate protection from the erosive action of rain and wind. This is correct up to a point, but the real cause of erosion is the practice of an agriculture which does not take full account of the natural limitations of the environment and causes soil exhaustion which is the invariable precursor of soil erosion, and the only certain cure is to utilize the land in a manner which maintains, and preferably increases, its fertility. Such a type of land utilization is general in the highly farmed countries of Western Europe, where, despite prolonged and intensive cultivation, the soils are probably now capable of greater and more sustained production than at any previous time. In the eroding countries of the New World comparable harmony between agriculture and the environment does not exist. In these countries the evolution of agriculture has been governed by opportunities—by the potentialities rather than by the limitations of the environment. The latter, however, are now making themselves felt. Agriculture must either develop into a process that increases the fertility of the soil, or cease altogether. The factors, chief among which is the climate, that determine how the soil must be cultivated so as to increase its fertility, are still largely outside human control. On the other hand, the factor

determining how the land actually is utilized is primarily economic. In general, men will always cultivate the land in the way that gives them the greatest economic advantage, and soil-exhausting agriculture tends to be easier and more immediately profitable than soil-conserving agriculture, which implies investing something in the land to pay a dividend at a later date. Consequently, although the measures required to stop soil erosion and build up soil fertility are simple and well known, they are not applied on a scale commensurate with the task unless and until the economic conditions of a country make it more profitable to conserve than to exhaust the soil. The first essential step in the soil-conserving agricultural revolution in Britain—the enclosure and pasturing of exhausted arable land—was promoted by the prosperity of the wool trade and the contemporary depression of the grain trade. In recent years the United States has apparently turned the corner from soil-exhausting to soil-conserving agriculture as a result of the disappearance of the export trade for soil-exhausting crops. The Agricultural Adjustment Administration set up to reduce the acreage of these unsaleable crops has become a powerful agent in encouraging the cultivation in their place of soil-conserving crops. The necessary requisites, then, for the accomplishment of soil conservation in an eroding region are, first, an economic system under which it is more profitable to increase than to destroy soil fertility, and second, and complementary, a form of society that will co-operate in the working of the economic system. Given these—they are complex functions of the environment—permanent soil-conserving agriculture follows automatically.

101. Conservation in a County's "Comeback." By F. N. Farrington. (*Agr. Eng.*, **22**, 10, 1941, p. 355. From *Exp. Sta. Rec.*, **87**, 2, 1942, p. 187.) Striking results of a conservation programme applied to an area considered to be approaching a worn-out condition are described. Terracing and ploughing under of winter legumes are credited with the greater part of the marked increases in crop and livestock production. An illustration shows a field abandoned as worthless for 15 years, then terraced and planted to Austrian winter peas, which were ploughed under and followed by cotton. The last-named crop then made a bale to the acre.

102. Variability of Eroded Material. By C. S. Slater and E. A. Carleton. (*J. Agr. Res.*, **65**, 4, 1942, p. 209.) The present study was started to clarify certain interrelationships in the variability of eroded material and, more specifically, to determine why organic-matter content fails to follow textural analysis. The results are summarized as follows: A series of soil losses and the corresponding plot soils have been analysed texturally and for their organic-matter content. Since rainfall was light, soil and surface conditions, rather than intensity and duration of rainfall, appeared to govern the textural composition of the eroded material. Under conditions favourable to infiltration and downward movement of fines, eroded material has been produced that is coarser in texture than the corresponding soil; under conditions of greater impermeability, eroded material has been produced that is finer in texture than the corresponding soil. These differences tend to disappear as erosion increases and the composition of the eroded material approaches the composition of the soil. Argument has been advanced to show that a disproportionate removal of fines need not be more serious than the removal of the same amount of soil in its total. Irrespective of texture, eroded material has been shown to be somewhat higher in organic-matter content than the eroding soil, especially where small runoffs are incurred. This anomaly has been shown to be the result of organic debris that is removed preferentially by the eroding process. If the effect of organic debris is discounted, colloidal material removed by erosion has essentially the same organic-matter

content as the colloidal material of the eroding soil. The textural separates of a soil are essentially identical with comparable separates from its eroded material, and, except for deviations due to organic debris or temporary physical conditions, all properties in which eroded material may differ from the soil must be the direct result of the relative proportions of separates that are included in the material.

103. Fate of Fertilizer when Applied to Soil. By R. Coleman. (*Miss. Farm Res.*, **5**, 4, 1942, p. 7. From *Sta. Exp. Rec.*, **87**, 3, 1942, p. 344.) According to this brief popular statement of the more elementary known facts concerning the behaviour of fertilizers in soils, most of the phosphate and much of the potassium applied will be retained and may benefit the crop of a succeeding season, but all nitrogen applied this year will be gone before next spring. A liberal application of lime should supply calcium to crops for several years.

104. Using Crop Residues for Soil Defence. By F. L. Duley and J. C. Russel. (*U.S. Dpt. Agr. Misc. Pubn.* 494, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 24.) An illustrated publication on the utilization of crop residues as a means of conserving soil and water. Crop residues are defined to include materials such as stubble, straw or stalks of various crops, or even old weed growth. Adjustments and modifications of farm equipment to carry out the programme for effective utilization of crop residues are described in detail. Data on the effect of the various treatments on soil and water losses and crop yields, soil moisture, and soil structure are given.

105. Cotton Plant: Fertilizer Treatment. By D. M. Sekirin. (*Voprosy Fiz. Khim. Melioratsii Pochv i Udobreniya Khlopchatnika*, 79, 1939. From *Summ. Curr. Lit.*, xxxiii., **2**, 1943, p. 25.) A fractional addition of fertilizers is recommended to ensure for cotton plants the required amount of the elements during all phases of their development. Before blossoming, N and P are consumed by cotton plants in a 3·5 : 4·1 ratio. During the blossoming period this ratio is displaced slightly in the direction of P, and it reaches 2·5 : 1·0 toward the ripening period. In April and May there is a maximum accumulation of ammonia in the soil. It is recommended to add ammonium nitrate instead of ammonium sulphate as well as a sufficient amount of K fertilizers. A considerable accumulation of nitrates is observed in the upper layers of the soil (0-5 cm.) during the summer period and in the subtillage layer (40-100 cm.) at the end of the vegetation period. Phosphorus is contained mainly in the 0·25 cm. horizon. Addition of elements such as B (2·8 kg. of borax per hectare) and Mn (111 kg. of manganese slime per hectare) increases the yields of fibres and seeds by 11-13 per cent.

106. Delta Fertilizer Studies Emphasize Need for Nitrogen. By R. Kuykendall. (*Miss. Farm Res.*, **5**, 1, 1942. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 748.) Effects of nitrogenous fertilizer on the cotton crops when applied for some years from various sources and on various soil types, and some of the general tendencies, are indicated.

107. Phosphate applied in Narrow Bands for Better Results. By R. Coleman. (*Miss. Farm Res.*, **5**, 1, 1942. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 749.) Placing the phosphate 2·5 inches to the side and 2 inches below the seed either in narrow bands or by hill dropping gave much better results for cotton than did any less concentrated placement in experiments in 1939-41. A badly eroded Atwood sandy loam was used in the 1939 test and Paden silt loam in those of 1940 and 1941.

108. The Physiological Rôle of Selenium in Plants. (*Nature*, CL. No. 3,792, 1942. From *Trop. Agr.*, xix., **11**, 1942, p. 224.) The following is abstracted from an article by Dr. Hugh Nicol. "From the point of view of

essentiality and uptake, one of the most interesting chemical elements is selenium. Its physiological rôle has been recognized only in the last decade, owing to the investigation of seleniferous soils. These soils have only a small selenium content, but cover vast areas in North America. Marco Polo recorded poisoning of animals in China which has since been shown to be referable to a seleniferous soil. A similar condition in Ireland remains unexplained. In their reactions to selenium, plants may be divided into four groups: (1) those which require selenium, (2) those which can tolerate large amounts in their tissues, (3) those which can tolerate small amounts but are poisoned by large amounts (these include crop plants such as wheat), and (4) those which practically exclude it. The last group comprises some native prairie grasses. The first group is formed by some species of the botanically varied genera *Astragalus*, *Oonopsis* and *Stanleya*; for these selenium is an essential element, and the concentration in the dry matter and in the seed may surpass 3,000 parts per million. Recently an amino-acid complex containing both selenium and sulphur has been isolated from grain and from *Astragalus*. Plants for which selenium is essential, such as certain species of *Astragalus*, will, of course, grow naturally only on seleniferous soils (the converse does not hold). Hence they serve as an interesting introduction to the subject of 'indicator' plants—that is, plants which by their presence or mode of growth indicate soil conditions."

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

109. Randomized Block Experiments: Statistical Treatment. By R. A. Fisher. (*Ann. Eugenics*, **11**, 1942, p. 341. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 136.) When making experimental comparisons of large numbers of factors in randomized blocks, it is often convenient to have comparatively small blocks, with only a few of the factors in each block. Such an experiment can be arranged to give valid estimates of the main effects of the factors and the chief interactions, leaving only the unimportant higher order interactions confounded with block differences. The theory of such arrangements is discussed and it is shown that if the number of experimental units (" plots ") in a block is n, arrangements can be found for n-1 factors such that all confounded interactions involve three or more factors. Arrangements are given for up to fifteen factors.

110. Random Sampling Distributions. By A. E. Treloar. (Burgess Pubg Co., Minneapolis, 1942. $2.25. Mimeographed. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 95.) The experimental scientist is frequently faced with the problem of interpreting a short series of observations by the method of statistics. In general he will have insufficient knowledge of mathematics to follow the deduction of the methods he finds it necessary to use. One course open to him is to use the technique of making statistical tests without understanding the reasons why. The author of the book under review objects to this course, and shows that the geometric method, which cannot in general give the definitive equations of random sampling distributions, can be effectively used to describe the properties of the distributions which enable them to be of use for the interpretation of data. After a chapter on the basis of statistical inference, he deals with the random sampling distribution of means and differences between means, emphasis being placed on the approach to normality of the distribution of the mean of a sample from a non-normal population with increasing size of the sample. The next three chapters deal with the sampling errors of the standard deviation and the comparison of standard deviations by Fisher's " z " distribution. There follow chapters on Student's distribution

and its use, the analysis of variance, the sampling errors of the correlation coefficients and the testing of regressions. It is felt that less space could have been spent on the distribution of means, etc., and more, for example, on the analysis of variances. The diagrams which illustrate the derivation of the distributions are, in general, very clear. A short, inadequate description of estimation by the Method of Maximum Likelihood is given, and the special advantages of this method are slurred over.

111. A GENERALIZED ANALYSIS OF VARIANCE. By F. F. Satterthwaite. (*Ann. Math. Statist.*, **13**, 1942, p. 34. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 221.) With a view to promoting more extended and varied use of the analysis of variance in its practical applications, this paper has been written to examine the basic principles of the method to demonstrate how designs (other than the present well-known simple standard types) may be constructed and applied to almost any data which can be assumed to be normally distributed.

112. THE DESIGN OF PLOT EXPERIMENTS FOR MEASUREMENT OF RUN-OFF AND EROSION. By A. E. Brandt. (*Agr. Eng.*, **22**, 12, 1941, p. 429. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 746.) In this factorially arranged control plat experiment, the main effects of the three variables are measured with the same precision as though the entire experiment had been devoted to each, and the possible interactions between them are measured with full precision. "If a research worker should attempt to answer all of these questions by letting but one factor vary at a time, he would be lost in a maze of experiments." The principles involved in the design of such an experiment and the successive steps of its development are discussed in some detail.

113. A NOTE ON THE SHAPE OF BLOCKS IN FIELD EXPERIMENTS. By R. Narain and A. Singh. (*Ind. J. Agr. Sci.*, x., **5**, 1940, p. 844.) The results of a soil-uniformity trial with *chari* grown at the Rawalpindi Agricultural Station have been presented and considered in a number of ways. Fertility contours indicating variations in soil fertility met with on this piece of land have been drawn. The drift of soil fertility indicated by the fertility contours has been confirmed by analysing the plot yields in the form of a Latin square. The suggestion that the precision of the experiment could be considerably increased if the blocks were made as compact as possible has been examined in detail, and it has been shown that compactness does not always result in the increase in precision. The advantage accruing from the provision of compact blocks depends upon the fact that the land within these is likely to be more uniform than within a block which is long and narrow in shape. This, however, is not always the case. If, therefore, by making the blocks compact different levels of soil fertility are introduced within any one of them the advantages of compactness will be considerably offset. It has been shown that the greatest precision in the conduct of the trial is obtained by keeping the land within the blocks as uniform as possible irrespective of the shape of the individual blocks.

114. RECENT ADVANCES IN MATHEMATICAL STATISTICS. By H. O. Hartley. (*J. Roy. Statist. Soc.*, **103**, 1940, p. 534. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 207.) An extensive bibliography of work on the theory and applications of statistics.

115. TREATMENT OF COTTONSEED. (*54th Ann. Rpt. Miss. Exp. Sta.*, 1941, p. 30.) An increase in yield of seed cotton from 67 to more than 420 lb. per acre at a cost of less than 25 cents is reported from a 10-year study of cottonseed treatment. Five per cent. ethyl mercury phosphate (New Improved Ceresan) and ethyl mercury chloride (2 per cent. Ceresan) are two good cottonseed treatment dusts, and the cost of treatment ranged between 12 and 24 cents per acre. Cottonseed treated at the gin and stored in either cloth or burlap bags was not harmed by the treatment or method of storage.

116. El Tratamiento de la Semilla del Algodonero con Productos Anticriptogamicos. By M. A. di Fonzo. (*Bol. Junta Nac. Algodon*, 81-82. Buenos Aires, 1942. From *Rev. App. Mycol.*, xxii., **2**, 1943, p. 64.) Full details are given of laboratory and field experiments (the latter in two widely separated districts of the Argentine, Chaco and Santiago del Estero) to determine the value of cottonseed treatment for the control of fungal diseases, especially those due to *Rhizoctonia solani*, *Glomerella gossypii*, and *Bacterium malvacearum*. In both localities the best results were given by granosan No. 4 (8 gm. per kg.) closely followed by Abavit 192 (universal), with germination percentages of 73·2 and 68·8, respectively, in Chaco, and of 46·6 and 45·3, respectively, in Santiago del Estero, the corresponding figures for the two controls in each series being 58·2 and 46·3 and 41·4 and 40, respectively. Another factor liable to reduce the germinability of cottonseed, the moisture content of which under local climatic conditions averages 12 per cent., is infection by organisms of the yellow mould (*Aspergillus wentii*) group. There was no reduction of germination in seed with an 8·5 per cent. moisture content after 4 months' contact with a fungicidal dust (4 to 12 gm. per kg.). (*Cf.* following abstract.)

117. La Humedad de la Semilla del Algodonero Relacionada con su Poder Germinativo y con la Presencia del *Aspergillus wentii*. By M. A. di Fonzo. (*Bol. Junta Nac. Algodon*, 85-86. Buenos Aires, 1942. From *Rev. App. Mycol.*, xxii., **2**, 1943, p. 64.) In laboratory experiments to determine the relationship of infection by *Aspergillus wentii* to the reduction of germinative capacity in cottonseed (Acala Blue Tag and Delta 11 A) of varying moisture contents, the fungus was found to assume an actively injurious form when the moisture content ranged from 11·2 to 15·2 per cent. Humidity alone was shown to be an important contributory factor to the loss of germinability in cottonseed, one lot of which, with an initial germinative capacity of 95·7 per cent., lost 33·5 per cent. in 10 days in an Erlenmeyer flask containing sulphate to saturation (98 per cent. humidity), while the addition to the flask of inoculum of *A. wentii* resulted in a decline of 74·5 per cent. of germinative energy during the same period. Seed treatment with an approved fungicidal dust is a simple, economical and effective method of protection against damage from this source.

118. Growth Substances in the Treatment of Cottonseed. By H. E. Rea. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 16.) Extensive use was made of growth substances, especially indolebutyric acid, in treatment of cottonseed prior to planting, and the effect of seed treatment on the abundance of lateral roots produced by cotton seedlings was studied. Counts were made of the number of lateral roots produced along the first inch of the tap root of 10-day-old seedlings grown throughout the year under greenhouse conditions. Seedlings from untreated fuzzy Watson seed produced an average of 15, 17, 15 and 15 lateral roots per inch during the spring, summer, fall and winter months, respectively. Seedlings from Watson seed soaked 24 hours in an aqueous solution of 250 parts per million indolebutyric acid prior to planting produced 21, 24, 15 and 7 per cent. more lateral roots than those from untreated seed during the spring, summer, fall and winter, respectively. Corresponding percentages for seed soaked in 500 parts per million indolebutyric acid solution were 42, 53, 23 and 5.

119. Effect of Chloropicrin on the Germination Capacity of Cotton Seeds. By Z. V. Ivanova-Aleksandrovskaya. (*Proc. Lenin Acad. Agr. Sci. U.S.S.R.*, **6**, 11, 1941. Moscow. In Russian. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 581.) In the experiments described, seeds of Egyptian and American cotton having moisture contents of 8·7 and 9·1 per cent., respectively, were fumigated with chloropicrin at rates equivalent to 2, 6 and 7

fl. oz. per 100 cu. ft., and in an atmosphere saturated with the fumigant. The temperature varied from 15° to 18° C. (59-64·4° F.), and the exposure lasted 24 hours. The germinating power of the seeds was affected only by the saturated atmosphere, whereas fumigation at rates of 1·8-2 fl. oz. per 100 cu. ft. is completely effective against the pink bollworm (*Platyedra gossypiella*) and 2-3 fl. oz. against other cotton pests. Seeds punctured in three places lost all their germinating power after fumigation. The resistance to fumigation of the seeds of Egyptian cotton decreased as their moisture content rose from 7·25 to 14·9 per cent., but fumigation at temperatures of 12-41° C. (53·6-105·8° F.) had no effect on germination.

120. Cotton Plant Dusting Machine. Niagara Sprayer and Chem. Co. Inc., New York. (U.S.P. 2,274,359. From *Summ. Curr. Lit.*, xxiii., **1**, 1943, p. 3.) A machine for distributing insecticidal powder has a hopper that converges to a slotted, rounded part which engages with a regulator plate having a graduated, adjustable orifice, so that the supply of powder can be controlled.

121. Cotton Harvesting Machine. By J. D. Rust. (Tenn. U.S.P. 2,268,623. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 581.) The cotton harvesting machine has an endless conveyor of slats carrying spindles, a plant tunnel, spindle guards below the spindles, and a trough extending from the rear to the front and discharging into the plant tunnel, this trough being located beneath the spindle guards along the side of the machine opposite the tunnelled side.

122. Cotton Harvesting Machine. International Harvester Co. (Chicago. U.S.P. 2,259,894. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 492.) An over-running clutch is interposed in the power-drive connection for the belt carrying the picking spindles on a harvesting machine, so that if the forward travel of the machine is greater with respect to the plants engaged by the belt than the peripheral speed of the belt as driven by the power-drive connection, the belt may be over-driven by engagement with the plants.

123. Cotton Harvesting Machine. By W. N. Smith. (Dallas, Texas. U.S.P. 2,261,572. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 492.) The machine has a pair of opposed picking assemblies, each comprising a casing, a number of rows of barbed spindles arranged in sleeves for successive reciprocating movement, an actuating bar for each row of spindles operated along a track by eccentrics on a pair of shafts journalled in the casing, and means for stripping cotton from the barbed spindles and passing it through a pre-cleaning assembly to a receiver.

124. Cotton Cleaning Machine. By J. F. Graham. (West Memphis, Ark. U.S.P. 2,258,928. From *Summ. Curr. Lit.*, xxii., **20**, 1942, p. 467.) Apparatus for cleaning cotton after it has left the gin comprises a lower flue provided with lengthwise corrugations, an upper flue with transverse corrugations, an elbow joining the flues, means for admitting cotton from the gin into the lower flue so that it travels across the corrugations and deposits its foreign matter on them, this falling through holes on to a conveyor, and means in the elbow to change the flow of air and cotton into longitudinal movement across the corrugations in the upper flue, where the cleaning is continued by similar means.

125. Cotton Cleaning Machine Screen. By J. T. Lawrence. (Inman, S. Carolina. U.S.P. 2,262,984. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 494.) The cotton is drawn by suction (applied at the outlet) past a beater and screen through which fine particles fall out, and is then conveyed by a lattice to a doffer leading to the outlet. The screen is formed of wire fabric supported on transverse and longitudinal slats arranged so as to provide an undulating or corrugated screen surface.

126. Cotton Cleaning and Drying Machine. By E. B. Hinckley, Jnr. (U.S.P. 2,276,397. From *Summ. Curr. Lit.*, xxiii., **2**, 1943, p. 28.) The machine has, on the same horizontal plane, a series of paddle drums rotating over dirt cages. Above each drum is a curved baffle plate from which the cotton rebounds to a cleaning screen over the next drum, falls on to this drum and is carried forward again. The cotton enters above the first drum, and means are provided for collecting the clean cotton and the trash. The space above the drums constitutes a series of chambers in which hot air is forced through nozzles into the streams of cotton discharged from the various drums.

127. Cotton Drying Tower. By R. M. Joyce. (Miss. U.S.P. 2,266,640. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 551.) Moist cotton and drying air enter at the top of an airtight tower, the space in which is filled out by a number of floors that provide a zigzag path for the cotton from the top to the outlet at the bottom. The space between the wall, the fixed end of one floor and the free end of the floor above, is occupied by a spiked roller to retard the cotton.

128. Effects of Artificially Drying Seed Cotton on Certain Quality Elements of Cottonseed in Storage. By R. A. Rusca and F. L. Gerdes. (*U.S. Dpt. Agr. Circ.*, 651, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 43.) A 2-year study of wet and dry cottonseed of the 1939 and 1940 crops, handled to simulate oil-mill and cotton-gin storage conditions, revealed that the process of artificially drying seed cotton at the gins has a beneficial effect on the storage qualities of the seed. Seed moisture content and temperature were decreased by the drying process, and development of free fatty acids was definitely retarded. Viability was increased slightly. A free fatty acid content of 2 per cent. was shown to be critical in so far as germination is concerned.

129. Cotton Gin Maintenance. By C. A. Bennett and F. L. Gerdes. (*U.S. Dpt. Agr. Leaflet*, 216, 1942. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 581.) Provides a general guide for "repairing and modernizing ginning machinery. The topics specifically dealt with are: checking pneumatic cotton-handling equipment; inspecting drying, cleaning, and feeding equipment; putting gin stands in shape; modernizing gin breasts; necessary attention to gin saws; testing lint-doffing systems; ginning bearings, belts, and pulleys; providing pure seed-handling equipment; inspecting lint-handling systems; checking kicker, tramper, and press; maintaining gin building; and care of the gin during the idle season."

130. A Practical Seed-Cotton Moisture Tester for Use at Gins. By G. E. Gaus *et al.* (*U.S. Dpt. Agr. Circ.* 621, 1941. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 690.) The tester is designed to register the hygrometric condition of the air confined within a mass of seed cotton by means of wet-bulb and dry-bulb thermometers, over which the air to be tested is drawn by suction provided by a vacuum cleaner. Drawings and a bill of material for the construction of the tester from standard pipe fittings and inexpensive accessories are included. A conversion table gives equivalent moisture content corresponding to the range of relative humidities indicated by the tester when used with seed cotton. A coefficient of correlation with drying-oven moisture determinations of 0·94 and a standard error of estimate of 1·48 per cent. were found. A moisture-content calculator employing a set of adjustable wet-bulb and dry-bulb temperature integrating scales for direct reading of corresponding moisture content from temperature readings made with the moisture tester is also described. A bill of material and specification for the construction and assembly of the calculator are included, and it is shown in photographs but not in working drawings.

131. Cotton Ginning for Pure Seed Preservation. By C. A. Bennett and F. L. Gerdes. (*U.S. Dpt. Agr. Leaflet*, 217, 1942. From *Exp. Sta. Rec.*, **87**,

6, 1942, p. 863.) This leaflet points out the means by which the mixing of seed of different varieties of cotton can be prevented during the ginning processes, and also the precautions which must be taken at any gin to make it suitable for the preservation of seed purity. Methods considered practical consist in the use of (1) self-cleaning belts, (2) self-cleaning blowpipe systems, (3) gravity chutes in two-storey gins, and (4) combinations of (1) and (2). Systems now in use for putting these methods into practice comprise: (1) A horizontal flat seed belt in a smooth trough below the stands, delivering either to an inclined belt or to a seed-blowing pipe through a vacuum wheel seed-feeder. (2) A reversible horizontal flat seed belt beneath the stands, operating in one direction to deliver gin-run seed and in the other to deliver pure seed, each discharging into disposal apparatus by various means. (3) Two individual conveyors beneath the stands, gin-run seed being handled in the front system and pure seed in the rear one, or vice versa, each screw system having its own lifts and deliveries. The pure-seed system, of course, is completely accessible for cleaning between runs. (4) In two-storey gins gravity chutes with hinged covers in front of or below each gin stand, diverting pure seed by gravity into funnels, sacks, or belts below. A standard screw conveyor is generally used on gin-run seed. (5) Gravity chutes similar to those described above, short enough for single or two-storey gins, delivering pure seed from each gin stand into a blowpipe by means of individual rotating vacuum-wheel seed-feeders. It is pointed out that when elevation of cottonseed is necessary, only the blowpipe or inclined-belt systems can be regarded as self-cleaning. Vertical screw and bucket-type elevators cannot be depended upon to be fully self-cleaning even when seed from several bales has been run through the system in an effort to clean it before commencing to save planting seed.

132. Compression of Cotton at Cotton Gins. By C. A. Bennett. (*Agr. Eng.*, **22**, 8, 1941, p. 281. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 432.) The author briefly describes present practices with gin bales, gin buildings and press types, and engineering features and performance of gin presses. He adds some account of an experimental cotton-gin press used by the U.S. Dpt. Agr. Bureau of Agricultural Chemistry and Engineering and the Agricultural Marketing Service in producing standard density bales of 24 lb. per cubic foot. The major elements of the all-steel construction are shown in drawings. A maximum load of 500 tons is planned for three rams, of which the travel is slightly more than 8 feet. One side of the press is fitted with a box 20 inches wide by 54 inches long by 111·5 inches deep, the other side is the conventional $27 \times 54 \times 111{\cdot}5$ inches in size. Bales of equal density pressed in the narrow box required about half as much pressure as those from the wide one, a reduction of 25 per cent. in width thus causing a reduction of 50 per cent. in the required hydraulic pressure on the rams. A study of pumping and piping arrangements is also mentioned, together with a device invented at the Cotton Ginning Laboratory to retain low-power requirements as pressures rise by cutting pump cylinders out of load service on proportionate steps of pressure.

133. Cotton Gin Roller Box Front. Lummus Cotton Gin Co. (U.S.P. 2,269,934. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 581.) The curved front wall of a gin roller box is carried by a shaft between end plates mounted on the gin heads, and is manipulated by a lever secured to the shaft and pivoted to the gin head at one side of the machine.

134. Cotton Press Control Mechanism. By J. J. Wallace. (Amite, Louisiana. U.S.P. 2,267,358. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 551.) In a cotton press of the type in which a pair of press boxes rotate alternately between a tramper and a ram, means are provided for simultaneously lifting

the boxes from their sills to permit them to rotate, and also for breaking the driving connection between a source of power and the tramper.

135. Cotton Baling Machine. By W. D. Cohea and H. S. Eubanks. (U.S.P. 2,284,044. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 112.) The press box can be divided into compartments and the oncoming stream of cotton fed at will to any compartment so that selected portions of the cotton occupy predetermined positions in the bale.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

136. Insecticides and Fungicides. By A. L. Efimov and I. A. Kazas. (In Russian. Moscow, Sel'khozgiz, 1940. Price 4 rub. From *Rev. App. Ent.*, xxx., Ser. A, **9**, 1942, p. 419.) Over 60 chemicals are now produced in the Russian Union for the protection of plants and plant products from injurious insects and fungi, and the properties and uses of the more important of them are reviewed in this book, which is intended for use in agricultural colleges. The first section contains general information on the classification and toxicity of poisons, methods of application and the physical and chemical properties that dusts, sprays and fumigants should possess to be effective against Arthropods and fungi. The second section deals with stomach and contact insecticides; it contains a chapter on arsenicals by P. V. Popov and others on compounds of fluorine and barium, sulphur and its compounds, soaps, oils, and insecticides of vegetable origin. Fumigants for the treatment of plants and stored products are dealt with in the third section, and fungicides in the fourth. The subjects discussed under each substance include its production, properties, methods of use, and action on insects or fungi, plants and man and domestic animals. Precautions to be adopted during the transport, storage and handling of poisons are summarized in a final section. The book has no index.

137. Cotton Insect Pests: Control. By R. C. Roark. (*Chem. and Eng. News*, **20**, 1942, p. 1169. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 489.) Lists are given of the principal insects attacking cotton plants in the United States and of the principal insecticides and fungicides used to combat them. These include arsenicals, fluorine compounds, contact poisons such as nicotine, rotenone, and sulphur, and organic-mercury seed disinfectants. The composition, uses, methods of application, and estimated annual consumptions are discussed.

138. Cotton Insect Problem met by Research Information as Basis of Poison Programme. By C. Lyle. (*Miss. Farm Res.*, **5**, 6, 1942. From *Exp Sta. Rec.*, **87**, 5, 1942, p. 695.) A practical account.

139. Protecting Cotton from Insects and Plant Diseases. By F. A. Fenton and K. S. Chester. (*Circ.* 96, Oklahoma Agr. Exp. Sta., 1942.) *Cotton pests.* Directions are given in popular terms for the control under Oklahoma conditions of boll weevil (*Anthonomus grandis*) by dusting with full-strength calcium arsenate (undiluted with hydrated lime) at the rate of 4 lb. per acre on young cotton and 5-7 lb. on older plants; of cotton aphis (*Aphis gossypii*) by dusting with 3 per cent. nicotine dust at the rate of 8-14 lb. per acre; of cotton flea-hopper (*Psallus seriatus*) by dusting with superfine dusting sulphur, by prevention of overgrazing, and destruction of croton weeds; of leafworm (*Alabama argillacea*) by dusting with undiluted calcium arsenate; of cotton bollworm (*Heliothis armigera*) by dusting with calcium arsenate at the rate of 10 lb. per acre.

Cotton Diseases.—Directions are also given for the control of cotton root rot (*Phymatotrichum omnivorum*) by crop rotation; of wilt (*Fusarium vasinfectum*) by the cultivation of such resistant varieties of cotton as Stoneville 2-B and Roldo Rowden and by the use of potash-containing fertilizer; of bacterial blight

(*Phytomonas* [*Bacterium*] *malvacearum*)—the most prevalent cotton disease in the State—by treatment of the cottonseed with " New Improved Ceresan " or " 2 per cent. Ceresan " (1½ and 3 oz. per bushel, respectively, costing 4 to 6 cents per bushel) or delinting with sulphuric acid (½ gal. per bushel), combined with crop rotation. Seed treatment is also recommended for the control of boll rots.

140. The Determination of Rotenone in Derris Root. By H. E. Coomber *et al.* (*J. Soc. Chem. Ind.*, July, 1942, p. 110. From *Bull. Imp. Inst.*, xl., **3**, 1942, p. 179.) Describes an improved method for estimating rotenone in derris root, employing the carbon tetrachloride complex separation. It has been shown by three groups of workers to give concordant results with various types of root. Methods of determining moisture content and chloroform extract are also given.

141. A Convenient Cage for Confining Insects to Plants. By J. T. Medler. (*J. Econ. Ent.*, **35**, 2, 1942, p. 283. From *Rev. App. Ent.*, xxxi., Ser. A, **1**, 1943, p. 19.) The author describes the construction of a small cage from a short celluloid tube, covered at one end with bolting silk or gauze, in which individual insects can be confined on plant parts without apparent interference with the normal activity of the insect and without injury to the plants. The cage can be fastened against such plant parts as cotton bolls with adhesive tape, or over leaves or stems by cutting one slit from the open end to take the petiole or two for the stem, and adjusting a cork in the end so that no space is left for the escape of the insect. The cage is light enough to be used on stems without support, but on petioles or leaflets it should be suspended by means of a bent pin in the cork.

142. Memoria de los Trabajos Realizados por la Estación de Fitopatologia Agricola de la Coruña, 1939-40. (*Publ. Estac. Fitopat. Agric.*, Coruña, 1941. From *Rev. App. Mycol.*, xxi., **9**, 1942, p. 403.) An account is given by J. R. Sardiña and P. Urquijo Landaluze of a species of *Empusa* parasitic on the aphids *Aphis gossypii*, *A. laburni* and *Capitophorus* (?) *whitei* on saltwort, bean, and chilli plots at the Experiment Station. Its branched, claviform conidiophores, 96·9 to 110·5 by 8·5 to 11·1 μ, bore subspherical primary conidia, with a truncate base and mucronate apex, 9·3 to 11·9 by 10·2 to 14·5 μ, and hyaline spores, shaped like grape pips, 21 to 30 by 10 to 11·5 μ. Affected aphids assume a chestnut to olive tinge. Inoculation experiments in the laboratory gave inconclusive results.

143. Insect Investigations by the Arkansas Station. By D. Isely *et al.* (*Ark. Sta. Bull.* 417, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 72.) A progress report of work in connection with boll weevil, cotton aphid, cotton leafworm, bollworm, common red spider, and cotton flea hopper.

144. Nyasaland: Report of the Entomologist, 1941. By C. Smee. (Zomba, Nyasaland, 1942. From *Rev. App. Ent.*, xxx., Ser. A, **10**, 1942, p. 502.) Pink bollworm was present on cotton in the Lower River districts in only small numbers, this being due possibly to a well-conducted " close season " campaign, which was also beneficial in one area against *Diparopsis castanea* (Red bollworm). Parasites on cotton included *Euplectrus laphygmæ* Ferrière, reared from *Laphygma exigua* Hb. and *L. exempta* Wlk., *Euplectromorpha obscurata* Ferrière, from *Tortrix* (*Cacœcia*) *occidentalis* Wlsm.

145. Cotton Insect Investigations in Peru. By F. F. Bibby. (*J. Econ. Ent.*, **35**, 2, 1942, p. 193. From *Rev. App. Ent.*, xxxi., Ser. A, **1**, 1943, p. 10.) An account of investigations carried out in Peru between September, 1938, and March, 1939, on the control of insect pests of cotton, chiefly *Aphis gossypii*. Infestation by the aphid was relatively unimportant in spring but serious in summer, apparently owing to the use of arsenicals, principally calcium arsenate dust, for the control of the Noctuids, *Alabama argillacea* and *Anomis texana*, and

an attempt was therefore made to find substitutes for the arsenicals. When dusts of cryolite and sulphur (20 : 80), Paris green and sulphur (25 : 75) and calcium arsenate were applied three times at weekly intervals after the spring aphid infestation, and before the Noctuids became injurious, aphid infestation was negligible in the control plots 2 and 3 weeks after the last application, little higher in those receiving cryolite, but severe in those receiving Paris green or calcium arsenate. In January, when both Noctuids and *Anthonomus vestitus* were present, the cryolite dust was rather less effective than calcium arsenate against the former, though it gave satisfactory control, and equal or superior to it against the weevil. In further tests, dusts containing 0·75 per cent. rotenone from cubé, with sulphur or an inert carrier, pyrethrum (0·1 per cent. pyrethrins) in sulphur (25 : 75), Paris green and sulphur (20 : 80), cryolite and sulphur or calcium arsenate were applied in January and February; Paris green gave complete control of the Noctuids, and the others, with the exception of pyrethrum, which was useless, were quite effective; rotenone gave rather better results with sulphur than with the inert dust. Aphid infestation became severe on the plots that received the arsenicals, but was negligible on the others. Although plants that were sprayed with calcium arsenate were less attacked by aphids than those that were dusted with it, dusting is considered to be preferable under conditions in Peru. Of three insecticides that were applied in February to plots heavily infested with the aphid, 1·2 per cent. rotenone in sulphur gave excellent control, and pyrethrum flowers (0·1 per cent. pyrethrins) and sulphur (25 : 75) was rather less effective, but much better than a mixture of nicotine sulphate and calcium arsenate containing 2 per cent. nicotine. It is, therefore, likely that the spring aphid infestation could be controlled with sulphur containing 1-1·5 per cent. rotenone. An outbreak of *Leucothrips piercei*, Morg. was effectively controlled in October by the application of dusting sulphur alone or with nicotine sulphate to provide 2 per cent. active nicotine.

146. QUEENSLAND: COTTON PESTS IN 1941-42. (*Rpt. Dpt. Agr. and Stock, Qnslnd.*, 1941-42.) The only seedling pest of any consequence was the tipworm which attacked early planted cotton in the Callide Valley. Weed growth in spring in the Callide Valley ensured a rapid increase in corn earworm population, and in December square damage in both irrigated and non-irrigated cotton was serious. With the advent of very dry conditions later the outbreak ceased. In autumn the cotton looper and the rough bollworm were numerous on the crop. Cotton jassid threatened to cause appreciable damage to cotton in February and March, but with improved growing conditions later squares were produced and matured in spite of the pest. The pink bollworm, though present in most districts, had little effect on cotton yields. This pest was recorded for the first time from Southern Queensland in cultivated cotton at Lowood. The pink bollworm project at Glenmore Ginnery was completed, and the final report showed that few, if any, of the larvæ survived the ginning process. This is probably due to the improved type of cleaning machinery installed a few years ago, which evidently eliminates most of the larvæ, such larvæ as are not eliminated in the cleaning process being apparently killed in the gins.

147. RUSSIA: RESULTS OF WORK OF THE PLANT PROTECTION STATION OF THE COTTON RESEARCH INSTITUTE ON PESTS AND DISEASES OF COTTON AND LUCERNE. (*Sojuznikhi*, Tashkent, 1941. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 56.) Tests of resistance to the attacks of red spider have shown Egyptian cottons and *G. herbaceum* to be the most resistant. The hybrid $F_6$46, which is characterized by very hairy leaf surface, is particularly resistant and has been classed as practically immune. This hybrid will be used as a parent for further breeding. The Egyptian × Peruvian hybrid 40/5963 also proved very resistant.

148. UNITED STATES: REPORT OF THE CHIEF OF THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, 1940-41. By P. D. Annand. (Washington, D.C., U.S. Dpt. Agr., 1942. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 589.) Several insecticides were tested for the control of the bollworm, *Heliothis armigera*, on cotton, since calcium arsenate is slow in action and not very effective against the older larvæ. The percentage mortalities among laboratory-reared larvæ varied inversely with their size, but averaged 92 for a mixture of equal quantities of basic copper arsenate and lime, 88 for lead arsenate, 84 for undiluted basic copper arsenate, 83 for cryolite containing 66 per cent. sodium fluoaluminate, and 62 for calcium arsenate. In field tests in Texas, the yield of seed cotton from plants that had been treated with cryolite containing 50, 66, 87 and 95 per cent. sodium fluoaluminate at the rate of 16-20 lb. per acre was increased by 51, 124, 163 and 179 lb. per acre, respectively, the corresponding increases for plots dusted with calcium arsenate, basic copper arsenate and lead arsenate at the rate of 8-10 lb. per acre being 144, 155 and 208 lb. When calcium arsenate, lead arsenate and micronized barium fluosilicate were applied as dusts and sprays, the increase in yield in plots treated with dusts averaged about 33·3 per cent. more than in those treated with sprays. Field observations have shown that heavy oviposition by *H. armigera* is not invariably followed by severe larval infestation and that the larvæ are often most injurious in fields in which aphids are common. In addition to hot, dry weather, which prevents hatching, the eggs and young larvæ are destroyed by predators, including Coccinellids, Chrysopids, Syrphids and *Orius insidiosus* Say. In the laboratory, this Anthocorid consumed many eggs daily when other food was scarce, but very few when aphids were present. A dust containing calcium arsenate and enough nicotine to destroy the aphids had little effect on *O. insidiosus*, and its use might increase the effectiveness of this predator in the field.

Introduced parasites reared and released in considerable numbers against the pink bollworm (*Platyedra gossypiella*) in Texas comprised *Chelonus pectinophoræ* Cushm., which was imported from Japan during the year, *C. blackburni* Cam., *Microbracon nigrorufum* Cushm., and *M. kirkpatricki* Wlkn. In the Lower Rio Grande Valley, pink bollworm continued to breed from May, 1940, until severe weather in January, 1941, destroyed the squares and bolls. The maximum durations of the larval diapause were from September 25 until June 11 in open bolls on standing stalks, from September 26 to April 21 in open bolls on the soil surface, from October 28 until May 20 in bolls collected green and left on the soil surface, and from October 28 until March 17 in bolls collected green and lightly covered with soil. The maximum survival rate occurred in bolls on standing stalks, so that it is desirable to cut the stalks or plough them under in autumn, even if the bolls cannot be destroyed. No larvæ were found to overwinter in free cocoons in the soil in this area.

149. TEXAS: COTTON PESTS IN 1941. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 30.) The severe injury caused by boll weevil was due to favourable weather conditions for its multiplication and to the shortage of calcium arsenate and dusting machinery. Cotton flea hopper (*Psallus seriatus*) infestation was less during the season, but cotton bollworm (*Heliothis armigera*) caused considerable injury. Most of the failure to obtain control of this pest was due to the inability of farmers to get into the fields with dusting equipment at the proper time, and to faulty application. Thrips damage was present in most fields of North Texas, and in 25 fields averaged 30 per cent. In the Presidio Valley the flood of 1938 and the initiation of the Bureau of Entomology's control programme against pink bollworm has greatly reduced infestation by this pest during the past three years. Introduced parasites were reared and released in the Presidio Valley as follows: *Chelonus blackburni*, 85,000; *C. pectinophoræ*,

55,000; *Microbracon kirkpatricki*, 18,185; and *M. mellitor*, 385. Colonization of *C. blackburni* and *M. mellitor* was terminated at the end of the season, these species having been given sufficient opportunity to become established.

150. Boll Weevil Control by Spraying or Dusting. By K. P. Ewing. (*J. Econ. Ent.*, **34**, 1941, p. 498. From *J. Text. Inst.*, xxxiii., **2**, 1942, A63.) For a light infestation by the boll weevil spraying with Pb arsenate was more effective, in terms of cotton yield, than dusting with Ca arsenate, but when the infestation was heavy dusting with Ca arsenate gave the best results.

151. Effect of Boll Weevil Control and Cotton Aphid Control on Yield as shown in a Factorial Experiment. By R. C. Gaines. (*J. Econ. Ent.*, **34**, 4, 1941, p. 501. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 66.) Experimental applications of calcium arsenate and of both calcium arsenate and nicotine dust were followed by significant reductions in boll weevil infestation at Tallulah, La., and College Station and Waco, Texas, and significant increases in yield at Tallulah and College Station. Applications of nicotine dust and of both nicotine dust and calcium arsenate were followed by significant reductions in cotton aphid infestation at all localities except Florence, South Carolina, but they did not significantly affect boll weevil infestation or yield at any locality. Applications of both calcium arsenate and nicotine dust interacted to cause significant reductions in cotton aphid infestation at Tallulah, College Station, and Waco, and to cause a significant increase in yield at Tallulah. Applications of calcium arsenate were followed by significant increases in aphid infestation at all localities. The increased yield following applications of both calcium arsenate and nicotine dust over that following calcium arsenate alone was 95 lb. of seed cotton per acre at Florence, 205 lb. at Tallulah, and 80 lb. at College Station, but at Waco there was a loss of 20 lb.

152. Boll Weevil and Cotton Aphid Control by the Use of Derris in Combination with Calcium Arsenate. By C. F. Rainwater and F. F. Bondy. (*J. Econ. Ent.*, **34**, 6, 1941, p. 733. From *Rev. App. Ent.*, xxx., Ser. A, **9**, 1942, p. 427.) Tests on the effect on *Aphis gossypii* Glov. of adding derris to dusts of calcium arsenate or equal quantities of calcium arsenate and sulphur, applied to cotton for the control of boll weevil (*Anthonomus grandis* Boh.), were continued in Mississippi, South Carolina, Louisiana, and Texas in 1940. Enough derris was used to give the mixed dusts a rotenone content of 0·5 per cent. Eight effective applications at the rate of 12 and 6 lb. per acre of dusts with and without sulphur, respectively, were made in each locality at 5-day intervals, beginning when the first blooms appeared, but the data on boll weevil in South Carolina and on the aphid in Texas were not analysed, as the infestations were too light. Statistical analysis of the remaining results showed no significant differences between any two treatments in the control of boll weevil, but a highly significant difference between each treatment and the untreated plots. Aphid populations were significantly lower after treatment with the dusts containing derris than after those without it, and in some localities yields were significantly higher after treatment with calcium arsenate and derris than after calcium arsenate alone; in some instances the addition of sulphur to the dusts caused significant reductions in the numbers of aphids. These results were confirmed by the experience of a group of farmers in North Carolina who used a mixture of equal parts of calcium arsenate and sulphur containing enough cubé to give a rotenone content of 0·5 per cent., and it is concluded that injurious numbers of aphids will not occur as a result of dusting cotton with calcium arsenate for the control of boll weevil if the dust contains this amount of rotenone.

153. The Importance, Distribution, Food-Plants and Natural Enemies of *Chalcodermus bondari* Marshall. By H. G. F. Sauer. (*Rev. Ent.*, **12**, 1-2.

Rio de Janeiro, 1941, p. 42. In Portuguese. From *Rev. App. Ent.*, xxx., Ser. A, **9**, 1942, p. 424.) The distribution, food-plants and natural enemies of *Chalcodermus bondari* Mshl., which does a certain amount of damage in north-eastern Brazil and in parts of the Chaco region in Argentina, are reviewed from the literature. In São Paulo the larvæ are parasitized by a Braconid of the genus *Heterospilus* and a Pteromalid near to *Zatropis incertus* Ashm.

[*Cf.* Abstr. **205**, Vol. XVII. of this Review.]

154. Notes on the Biology of *Conotrachelus denieri* Hust., a Pest of Cotton. By P. C. L. Denier. (*Rev. Soc. Ent. Argentina*, xi., **3**, Buenos Aires, 1942, p. 185. In Spanish. From *Rev. App. Ent.*, xxx., Ser A, **9**, 1942, p. 423.) These notes are based on observations made in the Territory of Formosa, north-eastern Argentina, and in a neighbouring district in Paraguay, where *Conotrachelus denieri* Hust. is a serious pest of cotton. The eggs are laid in cavities in the tender parts of plants of all ages and in the fruits. The larvæ mine the shoots and, as soon as they become available, the bolls. Very young seedlings are almost always killed by the attack, while older plants are delayed in development but sometimes recover. Infested bolls do not open. Pupation normally occurs in the soil at a depth of about an inch. The adult weevils feed on the stems, shoots and petioles and the parts of the roots close to the collar, causing the death of very young plants. The author has not observed the weevil on any plant other than cotton, though it has been stated in Paraguay to infest wild Malvaceæ occasionally, and larvæ found by him on other Malvaceæ have proved to be those of *C. rubicundulus* Boh. (which also infests cotton), or a still further species. Possible methods of control are discussed. The weevil is spreading, and where it has appeared for the first time and in small fields, the most practical measure is the immediate and complete destruction of the crop and the cessation of cotton growing. The campaign of eradication in Argentina is progressing satisfactorily, and cotton is not being grown for the present in the frontier districts.

155. Arizona: Investigations in Economic Zoology and Entomology. (*Ariz. Sta. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 819.) Includes a progress report of work on the biology and control of the cotton pest *Creontiades femoralis* Van D.

156. *Gasterocercodes* Pierce, sinonimo de *Eutinobothrus* Faust. By A. da Costa Lima. (*Chacaras e Quint.*, **58**, São Paulo, 1938, p. 471. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 585.) A weevil boring in *Sida* sp. in Minas Geraes, Brazil, has been identified as a species of *Eutinobothrus*, probably *puncticollis* Hust. As a result of the examination of specimens, the author considers that *Gasterocercodes*, Pierce, of which the species are *gossypii* Pierce and *brasiliensis*, Hambleton, is congeneric with *Eutinobothrus*.

157. Argentina: Dept. of Entomology, Tucuman. By K. J. Hayward. (*Rev. Indus. Agr. Tucuman*, 1942. From *Rev. App. Ent.*, Ser. A, **2**, 1943, p. 41.) Pests of cotton included *Heliothis armigera*, *Dysdercus* sp., and the Malachiid, *Astylus atromaculatus* Blanch., which injured recently sown cotton seeds.

158. Locusts. By F. D. Golding. (*Farm and Forest*, **2**, 8, Ibadan, Nigeria, 1941. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 562.) This paper consists mainly of a popular account of the bionomics and outbreaks of locusts in Nigeria, supplemented by data, based on a series of surveys, on their migrations in the outbreak areas as a whole. The outbreak of *Locusta migratoria* which was intensive in 1938, terminated suddenly in 1939, possibly because of the exceptionally late onset of dry (harmattan) winds. No swarms of *Schistocerca gregaria* have been recorded in Nigeria since 1931, but in July, 1940, the beginning of a new swarming period was suggested by the appearance of swarms in Southern Algeria, 350-600 miles from the Nigerian border.

159. ANTI-LOCUST CAMPAIGN. (*Crown Colonist*, April, 1943, p. 278.) An Anti-Locust Research Centre has been set up in London, financed by H.M. Government, various Colonial Governments, and the Government of the Anglo-Egyptian Sudan. The estimated cost in 1943-4 is £1,756. To meet present emergency conditions a mobile anti-locust organization, under the technical direction of the Research Centre, has been attached to the Middle East Supply Centre in Cairo. There are also in the Middle East and East Africa five reporting centres. Some £30,000 a year is being spent for the destruction of locusts in Persia, Arabia, Ethiopia, and the Middle East. This is additional to sums expended by the local Governments.

160. NOTE ON THE POISON-BAIT USED IN EGYPT FOR CONTROLLING LOCUSTS AND GRASSHOPPERS. By M. Hussein. (*Bull. Soc. Fouad 1er Ent.*, **25**, Cairo, 1941, p. 211. From *Rev. App. Ent.*, XXX., Ser. A, **9**, 1942, p. 422.) The poison baits used against locusts and grasshoppers in Egypt are made by moistening wheat bran with a prepared solution of 2·5 lb. sodium arsenite, 4·5 litres (about 1 gal.) molasses and 2·5 litres water, the mixture being diluted with water at the rate of 1 : 15. When stored in drums, the concentrated solution tends to deteriorate, and half of the soluble arsenious oxide was found to have been converted into insoluble arsenious or arsenic oxide after storage in a 4-gallon tin for three years. Laboratory and field experiments with hoppers of *Schistocerca gregaria* Forsk. in the first two instars have shown that the dosage of sodium arsenite in baits can be reduced to 0·5 lb. per 100 lb. of bran, but that the quantity of water should be not less than 15 gals. A bait made with 1 lb. sodium arsenite to 100 lb. bran gave equally good results with and without the addition of molasses. Baits containing 2 lb. sodium fluosilicate per 100 lb. bran for hoppers of the first two instars, and 4 lb. for older hoppers and adults, proved to be a satisfactory substitute for standard baits.

161. FIGHTING THE PINK INVADER (PINK BOLLWORM). By W. L. Wickline. (*U.S. Dpt. Agr., Off. For. Agr. Relat., Agr. in Americas*, **2**, 1, 1942, p. 3. From *Exp. Sta. Rec.*, **87**, 2, 1942, p. 254.) An account of work in the Rio Grande Valley.

162. THE TAXONOMIC STATUS OF THE SO-CALLED "COMMON RED SPIDER." By E. A. McGregor. (*Proc. Ent. Soc. Wash.*, **44**, 2. Washington, D.C., 1942. From *Rev. App. Ent.*, XXX., Ser. A, **12**, 1942, p. 600.) The author describes the characters distinguishing the males of the mite commonly known as *Tetranychus telarius* L. (for which he considers *T. althææ* v. Hanst., to be the correct name) and the lime-tree mite, *T. tiliarius*, Herm. (which is the species that he considers to be *T. telarius*) from each other and from *T. bimaculatus*, Harvey. In the course of the routine work of identifying spinning mites, he has accumulated data on the species occurring throughout the United States. *T. tiliarius* has never been identified from America, but both *T. telarius* (*althææ*) and *T. bimaculatus* have frequently been received from many localities in the United States and from Canada, and *T. telarius* also from Hawaii.

163. ON THE BIOLOGY OF RED SPIDER MITE (*Tetranychus telarius* LINN.) IN BALUCHISTAN. By N. A. Janjua. (*Proc. Ind. Acad. Sci.*, Sec. B, **15**, 5. Bangalore, 1942, p. 256. From *Rev. App. Ent.*, XXX., Ser. A, **11**, 1942, p. 509.) *Tetranychus telarius* has recently been observed in the hilly tracts of Baluchistan, from which it has not previously been recorded. All stages of this mite, its process of development and its manner of feeding are described. The time taken for the development of a generation was 22-28 days in winter and 9-12 days in summer, and in the Quetta Valley there are about 21 generations a year. Many fruit trees, vegetables and ornamental plants are attacked. The Coccinellid, *Adalia decempunctata* L., and a species of *Chrysopa* are predaceous on the mites at Quetta, but are not sufficiently numerous to afford much control.

164. *Reticulitermes tibialis* IN COTTONSEED HULLS. By C. H. Kinsley. (*J. Econ. Ent.*, **35**, 1, 1942, p. 76. From *Rev. App. Ent.*, xxx., Ser. A, **11**, 1942, p. 527.) Cottonseed hulls have often been used of recent years in grasshopper baits in California, and in 1941 over 200 sacks containing them were stacked for the summer in the open, only 171 feet above sea-level, on bare ground that was slightly damp at the time of stacking. At the end of the summer the bottom layer was found to be infested by *Reticulitermes tibialis* Banks, which is widely distributed in the Western United States and occurs frequently at high elevations. Termites had not previously been observed in this locality in cottonseed hulls.

165. HOST-SELECTION BY *Spathius critolaus* NIXON, AN IMPORTANT PARASITE OF *Pempherulus affinis* IN SOUTH INDIA. By P. N. Krishna Ayyar. (*Ind. J. Ent.*, **3**, 2. New Delhi, 1941, p. 197. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 582.) *Spathius critolaus* Nixon is the most important parasite of *Pempherulus affinis* Faust. on cotton in South India, and since it is the only parasite that attacks the first generation and can be bred rapidly on its other hosts, it might be used for the control of this weevil. Lists are given of other natural hosts, including the Buprestid, *Sphenoptera araxidis*, on *Sesbania*, and of other food-plants on which *P. affinis* is attacked. Tests on the nature of the response of the parasite to the sensory impressions produced by such stimuli as the shape, texture, odour, size and movement of the host showed that all these factors operate in combination to render the host suitable for attack and that no single factor can account for the resulting behaviour of the parasite, though size and movement have considerable effect on choice. A series of experiments carried out to determine the factors governing the incidence of superparasitism and the general interactions of host and parasite populations indicated that the parasites normally prefer host larvæ in advanced instars and under a covering: pupæ were never attacked and larvæ in the early instars and prepupæ rarely. The female was able to discriminate between unparasitized and parasitized hosts, attacking relatively few of the latter, even when the parasite eggs had been removed from them. When only parasitized hosts were available, considerable restraint in oviposition occurred; when unparasitized hosts were included, host larvæ containing eggs were occasionally accepted and those with first-instar larvæ usually rejected. Superparasitism was not unusual and was influenced by the number and nature of the hosts available, irregularity in the availability of hosts, and the food-plant of the host. Parasitism of hosts on unnatural food-plants occurred in the laboratory, except on a few poisonous ones, unless hosts on natural food-plants were also present, when superparasitism occurred in these. There was no unusual accumulation of eggs in the ovaries of females unable to oviposit. When superparasitism occurred, it was unusual for all the parasites to develop, mortality being due chiefly to competition for food. Hosts parasitized by *S. critolaus* were not attacked by other parasites of *P. affinis*.

166. ECOLOGICAL STUDIES ON THE SPOTTED BOLLWORMS OF COTTON AND THEIR PARASITES. II. THE FECUNDITY AND LONGEVITY OF *Earias fabia* AND ITS PARASITE, *Microbracon greeni lefroyi*, UNDER DIFFERENT CONDITIONS OF TEMPERATURE AND HUMIDITY. By T. Ahmad and G. Ullah. (*Ind. J. Ent.*, **3**, 2. New Delhi, 1941, p. 245. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 583.) In this paper, which is part of a series, the results are given in detail of laboratory investigations on the fecundity, reproductive potential and longevity of *Earias fabia*, Stoll, and its parasite *Microbracon lefroyi*, D. and G., which the authors consider a race of *M. greeni*, Ashm., together with a brief discussion of the incidence of the two species and *E. insulana*, Boisd., which is also a host of the parasite, on cotton at New Delhi in relation to weather conditions. The following is taken from the authors' summary. It was not possible to control humidity

during adult life, but rearing the pre-imaginal stages of both host and parasite at different saturation deficiencies affected the reproductive capacity of the adults. At the optimum range of temperature, 25-30° C. (77-86° F.), the fecundity of the host is distinctly lowered if it is bred from material under saturated conditions, and that of the parasite is reduced when it is reared from material under rather dry conditions (14 mm. saturation deficiency); the reproductive potential of the parasite is usually greatest when it is bred from material kept at a saturation deficiency of 0-3 mm., indicating that moist conditions are generally more favourable to it than to its host. In order to test the validity of the laboratory conclusions in the field, the incidence of *Earias* spp. and *M. lefroyi* was determined by weekly examination of cotton buds and bolls at New Delhi, during 1939 and 1940, and the data collected were plotted on graphs and correlated with temperature and rainfall. In both years parasitism began to increase with the first shower of rain, and as the rains were well distributed throughout the summer and the temperatures remained moderate, the parasite continued to be active, with the result that the bollworms did not become very injurious. These field observations support the laboratory conclusions that rains in summer help to control the bollworm both indirectly by lowering the temperature to the benefit of the parasite, and directly by increasing the humidity.

[*Cf.* Abstr. **165**, Vol. XVIII. of this Review.]

167. Étude sur la Biologie de *Dysdercus superstitiosus* F. By J. M. Vrydagh. (*Série Sci.*, No. 24. I.N.E.A.C., 1941. Price, 15 Fr.) Four species of *Dysdercus* (cotton stainer) are found in the cotton fields of the Belgian Congo. These are, in order of importance, *D. superstitiosus* Fabr., *D. nigrofasciatus* St., *D. melanoderes* Karsch., *D. hæmorrhoidalis* Sign. Of these the first named is by far the most abundant, and multiplies with such rapidity that the bolls formed towards the end of the season are almost entirely destroyed, and an important part of the crop is lost each year from the effects of *Nematospora* infection mainly conveyed by this bug. The paper under notice reports on a detailed laboratory study of the life history of the species, including an investigation of the effects of temperature on the rate of development.

168. Natural History of Termites. By V. W. von Hagen. (*Sci. Mnthly.*, **55**, 1, 1942. p. 29. From *U.S. Dpt. Agr. Bibliog. Agr., Sern. Ent.*, **1**, 1, 1942, C-11.) Pt. II. Their social organization.

169. A Simple Method of Controlling Termites. By J. C. Cross. (*Sci.*, **95**, 2469. Lancaster, Pa., 1942, p. 433. From *Rev. App. Ent.*, xxx., Ser. A, **8**, 1942, p. 389.) The author states that he has obtained freedom from termites in his home in Texas by pouring about a quart of used crankcase oil into a small ditch round each of the concrete piers supporting the building, and a proportionate amount round the base of the chimney. Some concrete steps were overlooked, and this was the only point at which termites subsequently entered the building. After they were protected with the oil no further trouble was experienced, though the surrounding soil was heavily infested. The oil remained in the ground for a long time, did not diffuse more than a few inches from the ditches, and did not appear to affect the growth of shrubs 6 inches away.

170. Some Results of Termite Activity in Thailand Soils. (*Trop. Agr.*, xix., **9**, 1942, p. 184.) " In many parts of Thailand termites are of considerable benefit to farmers. The millions of mounds built by termites furnish small plots of modified soil which when utilized properly are useful for growth of trees and of ' upland ' crops in paddy districts, thus permitting a considerable degree of diversification in cropping and diet. The nature and distribution of termite mounds, and physical and chemical analyses of ten termite mounds from widely

different parts of Thailand and of their associated normal soils are reported in *Thai. Sci. Bull.*, **3**, No. 2. The most striking chemical feature of the mound soils was the accumulation of calcium carbonate in the base of the mounds, although the normal soils of the places where the mounds were sampled were moderately to strongly acid. Near the place where calcium carbonate concretions ('gravels') were first recognized as having come from termite mounds no deposits of calcium carbonate were known within several miles. The soils of termite mounds usually had a higher air-dry moisture content, their pore space was usually higher, and some other physical properties showed higher values than did normal soils. The higher fertility and consequently the agricultural importance of the mounds are due to their higher plant-nutrient content and *p*H, the better moisture relationships, and to the fact that the upper portions of the mounds are above the water level on the padi land. Destruction of the mounds is seldom advisable. When mounds are broken down and the earth spread about the former site, the productivity of the land remains very irregular and the growth of tobacco may be prejudiced. In one district, however, other fertility relationships seem to prevail. Recommendations are made as to the method of complete clearing of termite mounds, should this be deemed advisable. No mechanism is suggested to account for the differential accumulation of calcium in the mounds or for the other chemical and physical soil differences revealed."

171. Recent Advances in Control of Fungous Diseases of Plants. By G. W. Padwick. (*Ind. Frmg.*, iii., **9**, 1924, p. 478.) The author discusses the value of plant hygiene, breeding for resistance to disease, soil conditions and plant disease, and the use of fungicides. A good deal is known about the effect of physical conditions in the soil in relationship to the development of disease. The temperature most favouring the development of a number of diseases is known; for example, the wilt diseases of plants caused by species of *Fusarium* are most severe at rather high temperatures. Wilt of cotton occurs with great severity when the temperature of the soil is about 28° C., and with a soil moisture of 60 per cent. of the water-holding capacity. The smut diseases of the common cereals occur at lower temperatures, about 10° for common bunt, 10° to 20° for oat smut, and so on. Often it has been found that this optimal temperature is the same as that for the vegetative growth of the fungus, independently of the optimal temperature for growth of the host. This rather rules out the popular idea that a plant grown at the ideal temperature is necessarily more resistant to disease. It also opens up a new field—namely, the sowing of seed at the time least favourable for disease to develop. An example can be found in the cotton crop in the Punjab, which suffers severe root-rot if sown in the month of May, but not if sown by the first week of April or towards the end of June. A common drawback in such a method is that the abnormal date of sowing has sometimes an adverse effect on yield. A similar effect can be brought about by growing the cotton crop intermixed with another crop such as moth (*Phaseolus aconitifolius*), which lowers the soil temperature. The results of this method of control of cotton root-rot have proved extraordinarily successful. There are, however, cases in which the optimum for the disease is far lower than the optimum for the growth of the fungi in pure culture. This is due to the fact that at lower temperatures certain fungi are much less susceptible than at higher temperatures to competition by other soil micro-organisms.

172. Las Enfermedades del Algodonero en la Republica Argentina. By M. di Fonzo. (*Bol. Junta nac. Algodon*, 80. Buenos Aires, 1941, p. 951. From *Rev. App. Mycol.*, xxi., **9**, 1942, p. 417.) A useful survey of the symptomatology, etiology, mode of propagation, economic importance, and relationship to environmental factors and control of cotton diseases in the Argentine, including

observations on angular leafspot (*Bacterium malvacearum*), anthracnose (*Glomerella gossypii*), soreshin (*Corticium vagum* or *Rhizoctonia solani*), wilt (*Fusarium vasinfectum*), boll rots associated with various organisms—*e.g.*, *Monilia sitophila*, *Rhizopus nigricans*, *Cephalothecium roseum*, and *Aspergillus niger*, rust (*Cerotelium desmium*), crown gall (*Bacterium tumefaciens*), sooty mould (*Capnodium* sp.), yellow mosaic, and ring spot. A separate section is devoted to the question of seed treatments.

173. ARIZONA: PLANT DISEASE STUDIES. (*Ariz. Sta. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 805.) Brief studies are reported on *Alternaria* infection of cotton bolls; cotton stubs, seed, and wind as sources of blackarm—angular leafspot infection; southern *Sclerotium* wilt and root rot of cotton; cotton rust (*Puccinia schedonnardi*).

174. A NEW CULTURE MEDIUM FOR THE GROWTH OF *Chætomium globosum*. By W. G. Chace and G. S. Urlaub. (*Amer. Dyest. Rptr.*, xxxi., **14**, 1942, p. 331. From *Rev. App. Mycol.*, xxi., **12**, 1942, p. 534.) The following cellulose agar medium was found at the Lowell Textile Institute to be superior to Czapek's agar for the development of *Chætomium globosum*, large quantities of the spores of which are required for the testing of mildew-proofed fabrics: 1,000 ml. water (tap or distilled with a trace of ferric sulphate), 3 gm. sodium nitrate, 1 gm. potassium dihydrogen phosphate (buffering the substratum at *p*H 5·0), 25 gm. magnesium sulphate, 0·25 gm. potassium chloride, 15 gm. agar, and 10 gm. filter paper. The use of this medium reduces the time needed for sporulation to four or five days, permits the production of spore quantities many times exceeding those obtainable on Czapek's agar, and virtually eliminates the common air-borne contaminants.

175. *Rhizoctonia* INFECTION OF COTTON AND SYMPTOMS ACCOMPANYING THE DISEASE IN PLANTS BEYOND THE SEEDLING STAGE. By D. C. Neal. (*Phytopathology*, xxxii., **7**, 1942, p. 641. From *Rev. App. Mycol.*, xxi., **12**, 1942, p. 524.) An uncommon phase of the cotton damping-off due to *Rhizoctonia* (*Corticium*) *solani* was noted in the Louisiana Delta in 1940 and 1941. Many of the plants in the early flowering stage, 7 inches to 14 inches high, were almost devoid of lateral roots, semi-prostrate, and with few fruiting branches. The stems bore deep-seated cankers above and below the soil-line, and many showed characteristic constrictions almost severing the stems just beneath the surface. About 90 per cent. of the cultures from infected tissues yielded *C. solani*. In cold, wet spring weather, the disease, which is usually confined to early planted cotton seedlings, may persist sufficiently late to cause appreciable damage to older plants.

176. INHIBITION OF MICRO-ORGANISMS BY A TOXIC SUBSTANCE PRODUCED BY AN AEROBIC SPORE-FORMING BACILLUS. H. Katznelson. (*Canad. J. Res.*, Sect. C, xx., **3**, 1942, p. 169. From *Rev. App. Mycol.*, xxi., **10**, 1942, p. 443.) The bacillus recently shown by Cordon and Haenseler to produce a thermostable toxin active against *Rhizoctonia solani* (and regarded by them as a rough strain of *Bacillus simplex*) was found by the author to produce a thermostable diffusible substance which inhibited the growth of 77 out of 81 species of fungi. Actinomycetes were more tolerant to it than fungi, though some were completely inhibited. The majority of streptococci, staphylococci, bacilli, lactobacilli, and clostridia tested were suppressed by the toxic medium, but Gram-negative organisms were unaffected. *B. subtilis* and, to some extent, *B. cereus* and *B. pumilus* also produced thermostable substances toxic to *R. solani*. The toxic substance produced by Cordon and Haenseler's organism was completely adsorbed by soil, bentonite, and activated charcoal, partly by agar, and not at all by talc; it passed through cellophane, parchment, and collodion, resisted autoclaving for 30 to 45 minutes at 15 lb. pressure, but was rapidly destroyed by

heating in alkaline (less rapidly in acid) solutions. It was not inactivated by aeration and retained its potency for many months at 0° C. It was not removed from the toxic medium by ether, chloroform, benzene, ethyl acetate, or N-butyl alcohol, but was partially eluted from charcoal with 95 per cent. ethyl alcohol.

177. Studies on the Foot-Rot Disease of Cotton in the Punjab. By R. S. Vasudeva. (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 165.) *Rhizoctonia* root rot is the most serious disease of cotton in the Punjab. Almost all Indian types and all the foreign types so far tested are severely attacked. Cottons are normally sown in May. The disease makes its appearance some time in June and continues to be vigorous during July. In August the attack slows down and almost ceases by the end of September. Attack may be evaded by sowing some time in the end of June or very early in the first week of April. Mortality is reduced to negligible proportions when *moth* (*Phaseolus aconitifolius*) is sown in between the rows. Plants which have wilted as a result of attack exhibit marked differences in chemical composition, but the only difference detected in soils bearing healthy and diseased plants is that the latter contain more acid-soluble calcium and have a higher Ca:Mg ratio.

[*Cf.* Abstr. in Vols. XIII. to XIX. of this Review.]

178. Diseases of Plants Recorded in Texas since 1933. By G. E. Altstatt. (*Pl. Dis. Rptr. Suppl.* 135, 1942. Mimeographed. From *Rev. App. Mycol.*, xxi., **11**, 1942, p. 481.) A list is given, arranged under the Latin names of the hosts, of the plant diseases caused by fungi, bacteria, viruses, or physiological factors, recorded in Texas since 1933. New host plants of the cotton root rot fungus (*Phymatotrichum omnivorum*) found since 1936 are included.

179. Texas: Cotton Root Rot Disease. By G. S. Fraps and J. E. Simpson. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 23.) Cultures of the cotton root rot organism tolerated moderate amounts of salts of tin, tungsten, barium, and strontium, and large quantities of ordinary salt. Iron salts up to 100 parts per million stimulated growth of the organism, and in larger quantities decreased growth. Cobalt, nickel, and titanium in small quantities inhibited growth.

180. Antibiosis in the Elimination of *Phymatotrichum omnivorum* Sclerotia from Soil. By F. E. Clark and R. B. Mitchell. (Abs. in *J. Bact.*, xliv., **1**, 1942, p. 141. From *Rev. App. Mycol.*, xxii., **1**, 1943, p. 21.) At Greenville, Texas, uncontaminated, viable sclerotia of *Phymatotrichum omnivorum* survived equally well in sterile, unamended and organic-amended soils. In non-sterile, amended soil, incubation temperatures favouring general microbial activity were more destructive to the sclerotia, 12, 30, 72, and 91 per cent. of which succumbed at 2°, 12°, 28°, and 35° C., respectively; at 28°, soil moisture contents of 35, 58, and 80 per cent. were found to be effective in the order given. Materials with narrow carbon : nitrogen ratios provided equal inhibition of the sclerotia with those of wider ratios less likely to meet good crop nutrient requirements.

181. A Root Rot of Cotton caused by *Thielaviopsis basicola*. By C. J. King and J. T. Presley. (*Phytopathology*, xxxii., **9**, 1942, p. 752. From *Rev. App. Mycol.*, xxii., **1**, 1943, p. 21.) *Thielaviopsis basicola* was isolated and identified in 1938 from the purplish-black, rotted vascular tissues of cotton roots collected at Sacaton, Arizona, in 1922, the disease being further observed in 1940 in the Upper Gila River Valley, nearly 200 miles distant from the original focus. In cultures on various standard media the cotton isolates resembled those from tobacco of Tennessee and Missouri origin, though minor differences in the colour and density of the colonies were observed, and on onion agar the cotton strain produced white or buff-coloured sectors which did not develop in the tobacco strain. Under natural conditions the root rot, which is also characterized by a

swelling of the tap-root near the collar, persists in the soil from one year to another, even in the absence of cotton cultivation. The fungus spreads slowly, and the damage caused by it is not ordinarily severe, except occasionally in the spring on American-Egyptian seedlings, which may recover temporarily during the hot weather, the occluded lesions, however, tending to resume activity in the autumn and to destroy the mature plants. Cross-inoculation experiments with the cotton and tobacco strains of *T. basicola* on Maryland Broadleaf tobacco and Pima cotton were successful, nearly all the inoculated plants showing either external or internal symptoms of the root rot, though only a few died.

182. Cotton Rust in Arizona. By J. T. Presley. (*Pl. Dis. Rptr.*, xxvi., **6**, 1942. Mimeographed. From *Rev. App. Mycol.*, xxi., **11**, 1942, p. 487.) During 1941 cotton rust (*Aecidium gossypii*) was present over a large area in Arizona, the outbreak being favoured by the prevailing weather conditions and the increased acreage of cotton on desert land. The *Bouteloua* grasses, which are alternate hosts of the fungus, are native to the south-west parts of the United States and may be expected to grow abundantly on most desert lands when water is supplied either by irrigation or rainfall. On ditch banks and in cotton fields where moisture is available the grass will grow for most of the summer, and reach a size many times that found in the desert; it is on this grass, in and immediately surrounding the cotton field, that most of the rust inoculum is built up. Directly a rainy period sets in, the teleutosori on the infected grass germinate and the cotton becomes diseased. Grass in a cotton field may be attacked early in the summer and re-infect the same field later in the same growing season, if weather conditions are favourable; teleutosori forming on the grass soon after infection are at once viable and may germinate within 48 hours. The following suggestions are made to assist in control. Dead, rusted grass in and round cotton fields should be destroyed by burning where possible, before the arrival of the summer rains, and improved sanitary practices instituted, especially with regard to ditch and fence rows. Fungicidal treatment, though possible, would be expensive and difficult.

[*Cf.* Abstr. **455**, Vol. XIX. of this Review.]

183. Tirak Disease of Cotton in the Punjab. See Abstract 17 in this issue.

184. Cross Inoculations with Isolates of *Fusaria* from Cotton, Tobacco, and Certain Other Plants Subject to Wilt. By G. M. Armstrong *et al.* (*Phytopathology*, **32**, 1942, p. 685. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 31.) Cross inoculation with wilt Fusaria from *Cassia tora*, tobacco, cotton, okra, tomato, watermelon, and cowpea showed that, while those attacking the last three were pathogenic only to their respective hosts, isolates from *Cassia*, tobacco, cotton and okra caused wilt in one or more other hosts.

185. Cotton Wilt in Alabama as Affected by Potash Supplements and as Related to Varietal Behaviour and Other Important Agronomic Problems. By H. B. Tisdale and J. B. Dick. (*J. Amer. Soc. Agron.*, xxxiv., **5**, 1942, p. 405. From *Rev. App. Mycol.*, xxi., **10**, 1942, p. 450.) The average incidence of cotton wilt (*Fusarium vasinfectum*) at various localities in Alabama in which experiments were conducted for three years and upwards ranged from 45 to 83 per cent. in the highly susceptible variety, Half-and-Half, and from 9 to 56 in the weakly tolerant group, including Cook 1138, Rowden 2088, Deltapine 12 and A, Delpress 3, Missdel 1 WR, and Miller 610. At six out of the nine test sites no appreciable difference between the reactions of the resistant (including Cook 307, Cook Wiregrass, Dixie Triumph 12, Siker WR, and Clevewilt 6 and 7) and highly tolerant (Coker's 4 in 1, Dixie 14-5, Dixie Triumph 85, Toole, Cook 144-68, and Cook 1006) varieties could be discerned, but at the remaining three

the former group was clearly superior to the latter. The increased severity of infection among the tolerant-resistant groups in two out of three localities may be attributed to potash deficiency (50 lb. or less replaceable potassium oxide per acre), while in the third root-knot nematodes were suspected of contributing to the virulence of the disease. The relatively constant ranking of cotton varieties with respect to wilt infection at the various experimental sites, regardless of the general severity of the disease, is interpreted as evidence against the existence of physiologic races of the pathogens, matters of more practical concern to growers being the differential response of the varieties under observation to potash and the influence of seasonal and other environmental factors. In two localities where wilt was severe only on the susceptible (Farm Relief and Coker 100) and highly susceptible (Half-and-Half) varieties, increasingly heavy applications of potash (8 per cent. or more) gave good results, whereas at another place, where the disease was exceptionally virulent, such treatments were beneficial only to the resistant group, which responded equally well, however, on another site to moderate amounts, larger quantities being harmful. The Sea Island variety, for the one year in which it was included in the tests, was immune from wilt in one place and showed only a trace of vascular discoloration near the end of the season in another.

186. Estudo Sobre a Fusariose do Algodoeiro. By F. R. Milanez and J. Joffily. (*Rodriguesia*, V., **14**. Rio de Janeiro, 1941, p. 325. From *Rev. App. Mycol.*, xxii., **1**, 1943, p. 20.) The material used in the writers' studies of cotton wilt (*Fusarium vasinfectum*) was obtained from plants of the A.M.41 variety grown in soil heavily contaminated with aqueous suspensions of the hyphæ and spores of the pathogen, the presence of which was verified for the first time in Brazil in 1935. In all the sections examined the fungus was detected in the interior of the vessels, and as soon as the vitality of the adjoining tissues declined they were also invaded by the hyphæ. The penetration of the roots through layers of living cells is attributed to the death of the latter from the effects of fungal toxins. The multiplication of *F. vasinfectum* was observed in several regions of the vascular system from the root tracheæ up to the leaf veins, the midrib of one of the leaves inspected being so densely infested that some of the vessels appeared to be occluded. The paucity of fungal elements commonly found in the vascular system of diseased plants, however, is in accordance with recent views on the toxic action of *F. vasinfectum*. Microconidia, 4 to 9·4 by 1·4 to 2·2 μ, were observed, apparently for the first time, in the root tracheæ, petioles, and secondary veins of living plants attacked by the wilt disease. The importance of these organs, especially in the leaves, in relation to the spread of infection is emphasized. When sections of the inoculated plants were mounted in liquid paraffin between the slide and cover glass, the hyphæ continued to grow, giving rise to microcultures, macro- and microconidia often developing within twenty-four hours and chlamydospores in five or six weeks. *F. vasinfectum* would thus appear to share with *Aspergillus flavus* the property of utilizing liquid paraffin as a source of carbon and energy, and this characteristic may be of value in the diagnosis of cotton wilt and the isolation of its agent.

187. Memoria Anual de 1940 del Jefe del Departamento de Investigaciones de Algodon y Cereales, Estacion Experimental Agricola de la Molina, Lima, Peru. By T. B. Barducci. (*Rev. App. Mycol.*, xxi., **12**, 1942, p. 517.) The following items of phytopathological interest occur in the report. During the season of 1939 to 1940 studies were conducted on 26 Tanguis cotton selections and the progenies of 378 plants phenotypically resistant to wilt (*Verticillium* sp.), from which 13 of the former and 61 of the latter, besides 202 phenotypically immune individuals, were reserved for further trials in connection

with the work of breeding for immunity from the disease. The average percentages of wilt in the selections and control variety (Hualcará, current season) at 93, 121, 155, 188, and 212 days were 6·81, 16·28, 21·01, 22·11 and 87·21 and 10·81, 29·40, 40·93, 44·29 and 92·29 respectively. In 1933-4 and 1937-8 the maximum incidence of wilt developed during a period extending from 100 to 140 days after sowing, when the optimum soil temperature (22° C.) for the growth of the pathogen at a depth of 5 cm. to 1 m. prevails. In 1938-9 and 1939-40 the selected strains were not attacked during the critical period, indicating an increase in genotypic resistance.

188. South Carolina: Plant Disease Studies. (*S. Car. Sta. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 378.) Reports progress in the study of diseases of cotton seedlings and bolls; mineral nutrition and *Fusarium vasinfectum* resistance in a susceptible and a wilt-resistant cotton variety; cross-inoculations with *Fusarium* wilt organisms; tests of new varieties of wilt-resistant cottons; self-pollination and selection of wilt-resistant lines of Super 7 cotton.

189. Tennessee: Cotton Wilt Studies. By C. D. Sherbakoff. (*52nd and 53rd Ann. Rpts.*, 1939 *and* 1940, Tenn. Agr. Exp. Sta. From *Rev. App. Mycol.*, xxi., **10**, 1942, p. 440.) In further regional studies on cotton wilt by the author in co-operation with the U.S. Department of Agriculture, the Dixie Triumph 12 and Clevewilt 6 varieties showed complete resistance to the disease over a 3-year period, whereas Miller 610 and Rowden 2088 were dependable in this respect only where infection was mild and a balanced fertilizer, including sufficient potash, had been applied; Coker 100 and Half-and-Half sustained severe injury even from slight attacks of the fungus.

GENERAL BOTANY, BREEDING, ETC.

190. Evolution, the Modern Synthesis. By J. Huxley. (George Allen and Unwin, Ltd., London, 1942. Price 25s. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 96.) This book is based on a series of lectures given in 1936 to the British Association on " Natural Selection and Evolutionary Progress." It is, however, much more than this, since its 645 pages contain a wealth of information on all lines of modern genetical, cytological and taxonomic study that help to throw more light on the process of evolution. In particular the valuable work of R. A. Fisher is stressed in showing how the effect of a mutation can be altered by new combinations and mutations of other genes. The author states that any originality that his book may possess lies in attempting to generalize this idea and in stressing the need for the study of the effect of genes during development. Equally original is the presentation and analysis of a vast quantity of taxonomic data in the light of modern genetical and evolutionary theories. The presentation of the latest ideas on the species problem, geographical, ecological and genetical specification, evolutionary trends and evolutionary progress is of value to workers in every branch of biology. In the last chapter on evolutionary progress the author deals not only with evolutionary processes in plants and animals, he also applies this to man, realizing at the same time that the methods of evolutionary change, varying as they do for species with different modes of life and of differing degree of complexity, must with man be capable of conscious control; in man for the first time purposeful evolution is at least a possibility. The book ends with a large and useful list of references of thirty-five pages and is well indexed.

191. The Reproductive Capacity of Plants: Studies in Quantitative Biology. By Professor E. J. Salisbury. (G. Bell and Sons, Ltd., London, 1942. Price 30s. net. Reviewed *Nature*, vol. cli., 1943, p. 319.) In this volume the author has collected together measurements, accumulated over a period of

fifteen years, of the number of fruits and seeds produced by sample populations of a wide range of species of representative habitats, with the object of examining quantitatively the rough impressions and certain teleological assumptions that have gained currency. Among the leading questions propounded is whether the relative abundance and frequency of different species are correlated with their reproductive potentialities. On the other hand, since on the average the number of individuals of different species remains approximately stable, it has been commonly assumed that natural selection has brought about a nice adjustment between seed output and mortality. Is reproductive potentiality in fact proportioned to vulnerability, or is the production of a large progeny rather to be regarded as merely wasteful? The complexity of the problems is made apparent from the outset. The author points out, for example, that fluctuation in number of offspring has the effect of countering the danger from predators. Though " mast " years lead ultimately to an increase in number of predators, the inevitable lag enables the sudden abundance to be effective in increasing the number of individuals, at least temporarily, and possibly securing the spread of the species. Another complicating factor is seed size, which is examined and discussed in Chapter 2. It is established that the more advanced the phase of ecological succession the larger are the seeds, on the average, of the species characterizing the vegetation; and the author points out that the smallest seeds are to be found among plants of open habitats, and also among parasites, saprophytes and mycorrhizal plants, which are not dependent for survival on early photosynthesis. In Chapter 3 it is shown that parental vigour, estimated by the number of fruits borne, has no significant effect on the viability of the seeds set and very little on their size. Apparently, below a certain minimum of food supply an ovule or seed aborts and the effect of starvation is seen in fewer seeds of nearly normal size. Having defined his terms, of which the most important is reproductive capacity, the product of the average seed output per plant and the average percentage germination, the author then examines the data for different edaphic and climatic conditions and the effects of competition. He remarks that competition may sometimes be the more important, and gives examples of perennials in which the onset of reproduction is delayed for years by competition. Between individuals of the same species, on the other hand, while competition leads to depauperate individuals, it affects the total output but little whether many small or few large plants survive. In Chapter 7 it is established that no correlation exists between number of capsules per plant and number of seeds per capsule. The remainder of the book is devoted to a comparative study of reproductive capacity over a wide range of examples. The general conclusion frequently emerges that there is no evidence of reproductive capacity being correlated with risk of mortality, but definite evidence of correlation with extent of geographical range (*e.g.*, Scilla spp.) and with relative abundance (*e.g.*, Hypericum spp., Gentianaceæ). Vegetative spread and multiplication complicate comparisons and receive special discussion in the concluding chapter. The discussions of special cases are full of interest and are informed throughout with original observations which add greatly to the value of the book. To the general reader it may be a matter of regret that the statistical data are given *in extenso* throughout the text. The summaries and, still more, the many comments and original observations are in consequence more difficult to pick out. While it is desirable that data so laborious of collection should be permanently preserved and accessible, the value of the book would, it is suggested, have been increased had the bulk of the data been segregated.

192. Cytology and Cell Physiology. By G. Bourne (Editor). (Clarendon Press, Oxford, 1942. Price 20s. From *Pl. Bre. Abs.*, xii., 4, 1942, p. 292.) This book is well described by a paragraph in the preface: " In this book an

attempt has been made to bring together chemical, physicochemical, and morphological aspects of the study of cells. It has not been the aim to cover the whole field of cytology or of cell chemistry; indeed, it would take a series of volumes to do so. The best that one can do is to choose a number of subjects which are representative of different fields of the study of cells and which relate, as far as possible, one to the other, and to bring them together within a single cover." The separate chapters are all well written, but, good though the individual contributions are, one is left with the impression that a somewhat greater effort should have been made to link them together. The book is, however, a valuable one and merits the attention of all cytologists and experimental biologists. The unfamiliarity of much of the material should broaden the outlook of many workers and suggest to them new fields of investigation in their own specialist branches.

The following are the contents of the book: "Some aspects of cytological technique" (J. R. Baker); "Physical and physicochemical studies of cells: Part I.—General" (J. F. Danielli), "Part II.—Monolayer technique" (J. H. Schulman); "The cell surface and cell physiology" (J. F. Danielli); "Mitochondria and Golgi apparatus" (G. Bourne); "Nucleus, chromosomes and genes" (M. J. D. White); "Micro-incineration and the inorganic constituents of cells" (E. S. Hornung); "Enzyme systems of cells" (H. Blaschko and W. Jacobsen); and "Pathological aspects of cytology" (R. J. Ludford). Plant geneticists and cytologists will be familiar with most of the work described in White's excellent chapter, but they will find points of special interest to them in the chapters by Baker and Bourne. The book includes a list of references, an index of authors and of subjects. The production is of the usual high standard to be expected from the Oxford University Press.

193. Texas: Cytogenetics and Improvement of Cotton. By J. O. Beasley and T. R. Richmond. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 72.) A hexaploid produced by doubling the chromosome number with colchicine in a hybrid of *G. hirsutum* × *G. anomalum*, a wild African species, had remarkably regular meiotic chromosome behaviour, a pollen fertility of about 85 per cent., fibres finer than Upland and with finer convolutions, but the yield of fibres was too low for the hexaploid to be of commercial value. The hexaploid has been backcrossed twice to Upland. Seeds produced from plants of *G. arboreum* (Nanking Asiatic cultivated) × *G. thurberi* (Wild American) in which the chromosome number was doubled and crossed with *G. hirsutum* (Coker 100) and backcrossed to the *G. hirsutum* gave an extremely variable population. Some of the plants were prolific, but the percentage of lint was low. The fibres of some of the plants were finer than those of the Upland parent, had fewer convolutions, and were stronger. Self-pollinated seeds were produced on these plants and the more promising ones were transferred to the greenhouse, where they are being backcrossed again to Upland.

About 30 plants from a hexaploid of Upland (Half-and-Half) × Asiatic (Nanking) backcrossed twice to Upland gave a range in fertility from 0 to more than 50 per cent. All the plants examined had over 26 pairs of chromosomes, and some had 4-5 extra ones (from the Asiatic parent). As many as possible of the plants were self-pollinated and also backcrossed again to the Upland parent. Some of the plants had fibres coarser than Upland, and others showed some of the resistance to angular leafspot possessed by the Asiatic parent. Plants selected for high fertility in the F_2 of a hexaploid of *G. hirsutum* (Half-and-Half) × *G. arboreum* (Nanking) gave progenies with approximately the same percentage of sterile plants as the F_2 progeny. Doubling the chromosome number in a plant in which about half of the homologous chromosomes failed to pair did not increase the percentage of chromosomes that pair. This indi-

cates that doubling chromosome number does not increase chromosome pairing in plants in which pairing is interfered with by a gene combination. Doubling chromosome number in hybrids in which pairing is prevented by different arrangement of genes in the chromosomes is followed by approximately normal pairing.

194. CYTOGENETICS AND IMPROVEMENT OF COTTON. By J. O. Beasley and T. R. Richmond. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 14.) In 1941 six species hybrids were produced in addition to the ones already available at this Station. From some of these sterile hybrids and hybrids produced earlier, seven additional polyploids were produced, three of which are considered new species. Seven polyploids produced from American Upland and wild species on Asiatic cultivated cottons have been backcrossed one to three times in attempts to transfer genes of economic value to American Upland types. Some of these progenies showed no infection of angular leafspot. A few plants from the second backcross of a hybrid involving the wild cotton from South-Western United States and American Upland cotton had fibres with a strength index equal to that of fibres of Sea Island cotton. From the backcross work in which hexaploids were backcrossed to American Upland, which is tetraploid, one or more generations can be eliminated by using the first backcross, a pentaploid, as the pollen parent. In a population grown from seeds produced by pollinating normal flowers of Rogers Acala with X-rayed pollen, one haploid was found. If this haploid was the result of X-raying pollen the frequency of the haploids is too low to be of commercial value. The chromosome number has been doubled in haploids of three Upland varieties, Acala, Stoneville, and Mexican, to produce pure lines.

[*Cf.* Abstr. **202**, Vol. XVIII., and previous abstract.]

195. NEW PATHS IN GENETICS. By J. B. S. Haldane. (George Allen and Unwin, Ltd., London, 1941. Price 7s. 6d. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 291.) This book is based on a series of lectures given at Groningen in 1940. It gives a very lucid and interesting account of several aspects of genetics, in the development of which Professor Haldane has been specially concerned, though of course it is in no way limited to the results of his own research. Nearly all the material in it has been published separately, but, in view of the immense practical importance of the problems discussed, it has a very real value in connecting together scattered publications. Particular emphasis is placed on the value of combined genetical and biochemical studies as an aid to the understanding of physiological processes. Studies of certain human abnormalities such as phenylketonuria, alcaptonuria, etc., and the flower pigment work carried out by Scott-Moncrieff, Robinson, and others, are cited at length. The specific mode of action of various genes in development receives considerable attention, and many examples are cited, particularly in poultry and rodents. It is shown that genetic mutants form very valuable material for the physiologist who is studying the complicated interrelations involved in either normal or abnormal development. The last two of the five chapters of the book deal with human genetics. Examples of the various modes of inheritance of genetical defects are given, and the mathematical relations between mutation and selection are discussed, with particular reference to the possibility of reducing the various types of abnormality by means of negative eugenics. The effect of the change in fairly recent years from a state in which marriages took place almost entirely within small, isolated communities, to one in which mating is more nearly at random, is discussed. Gene linkages and suspected linkages in man are dealt with in the last chapter, and particularly Haldane's own discovery of partial sex linkage and the beginning of chromosome mapping. Some indication of the complexity of calculating linkages in human pedigrees is given.

196. ABSTRACTS OF PAPERS, 1915-1941. By S. C. Harland. (*Soc. Nac. Agraria Inst. Cott. Genet.*, 1. Peru, 1942. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 55.) Abstracts are given in English of all the papers published by the author during the period 1915-41.

197. INDORE INSTITUTE OF PLANT INDUSTRY: RESEARCH WORK, 1940-41. (*Ann. Rpt. Ind. Cent. Cott. Comm.*, 1940-41.) *Cotton Genetics.*—Five genes responsible for lintlessness in Asiatic cottons have been identified and, while some of the interrelationships among them have been worked out and published, work is in progress to complete the study and to determine the linkage relationships of the several lintless genes to other known genes. Data obtained last year from the study of a single F_2 family indicated that there was free assortment between 1027 lintless gene li_a and the anthocyanin gene *R*; this was confirmed during the year from the study of a larger F_2 population, showing definitely that the lintless gene li_a is not linked with anthocyanin locus in Asiatic cottons. The independent segregation of this gene with lint colour gene *K* was also confirmed in a cross with narrow *Kokati* type. The study of the crosses with *arboreum* lintless types has indicated that wherever there is segregation of hairy linted and hairy lintless there is a significant deficiency of the latter group which can only be explained as being due to the action of modifiers whereby some lintless plants appear as linted. . . . The differences in viability according to environment in the normal linted, short linted (heterozygous) and lintless (homozygous) types, reported last year, were tested in two replicated experiments, at Indore and Sri Ganganagar respectively. No difference in viability was reported among the three types at Ganganagar, but at Indore normal linted was more viable than short linted, and short linted than lintless. . . . The three types, normal linted, short linted and lintless, had different growth rates and the final heights attained by the plants were in the order, linted, short linted and lintless. The effect of the lintless gene is to shorten the internodes, making the plant appear dwarfed.

In crosses made between Buri naked (really tufted) with two fully fuzzy types, C.920, M.U.4, to study the inheritance of fuzziness, the F_1 and F_2 means and the F_3 behaviour gave an indication of the non-fuzzy nature being dominant. Studies on several crosses with a type Tellapathi (*G. arboreum* var. *neglectum* forma *indica*) obtained from Coimbatore showed it to be a new member of the anthocyanin multiple allelomorphic series. It is designated R_2^{GS} and is characterized by the absence of a leaf spot and pigmentation in stamen filaments. R_2^{GS} is complementary with R_2^{OS} for the production of pigment in stamen filaments and leaf spot. The significant increase in the ginning percentage as a result of X-raying seeds of M.U.4 and Upland cottons for 20 minutes was again manifest during the year.

The *arboreum* strains, Malvi, Bani and C.520, on which considerable work has been done in regard to quantitative inheritance, were utilized for determining the physiological basis underlying the manifestation of hybrid vigour. The three parents and their reciprocal F_1s were grown during the year in a randomized and replicated experiment and the following observations were taken: Plant height every 15 days, leaf area, dry weight of leaves and stems separately and dry weight of reproductive parts on random duplicate plants taken from each plot at intervals of 20 days. A rough examination of the data indicated that it was the increased meristematic capital with which the hybrids started which accounted for the manifestation of vigour. This was more apparent in the cross Malvi × C.520, where, due to greater parental differences in seed weight and meristematic tissues, the differences between the reciprocal F_1 were very striking.

198. SOME OBSERVATIONS ON GENE VARIABILITY AND SPONTANEOUS MUTATION. By L. J. Stadler. (*Spragg Memor. Lectures Pl. Bre.*, Mich. Sta. Coll. (1939), 1942,

p. 3. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 24.) "The experimental analysis of gene mutation is not necessarily a technical impossibility. The mutations which occur spontaneously produce alleles of definite and distinctive properties; their apparent rarity may be only a consequence of the crudeness of our methods of detecting variability. In the case of some genes it may be feasible to determine the frequency of mutation from and to various distinct levels and types of activity, and to compare in detail the physiological action of the parent and the mutant alleles. Intensive studies of these two kinds should yield results on the basis of which specific hypotheses of gene structure and gene action may be formulated and experimentally tested."

199. NUCLEOLI AND RELATED NUCLEAR STRUCTURES. By R. R. Gates. (*Bot. Rev.*, **8**, 1942, p. 337. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 25.) The review includes reference to the following aspects: nucleolar size (special reference to wheat and rice varieties); nucleoli and satellites (tables of species in which apparent diploids with four nucleoli are recorded); and the phylogenetic significance of nucleoli. It is concluded that the number of nucleoli in the cells of a species is probably as important phylogenetically as the number of chromosomes. Future reports of chromosome numbers should include at least a determination of the number of SAT chromosomes, the number of secondary constructions and the number and sizes of the nucleoli in somatic telophase.

200. CHROMOSOME DEGENERATION IN RELATION TO GROWTH AND HYBRID VIGOUR. By D. F. Jones. (*Proc. Nat. Acad. Sci., Wash.*, **28**, 1942, p. 38. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 24.) The question of heterosis is re-examined in the light of recent research. The depressive effect of inbreeding is thought to be due to chromosome deficiencies too small to have any other visible effect. The fact that almost all combinations of inbred parents give heterosis shows that the number of loci which may be deficient is exceedingly large.

201. THE DISTRIBUTION OF X-RAY-INDUCED CHROMOSOMAL ABERRATIONS. By K. Sax. (*Proc. Nat. Acad. Sci., Wash.*, **28**, 1942, p. 229. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 24.) Multiple aberrations were much less frequent than was expected in X-rayed material, while ring chromosomes were more frequent than would be expected. The factors determining the frequency of effective breaks are thought to be (*a*) the spatial relations of the chromosome, (*b*) the stresses imposed by the centromere in maintaining polarity and (*c*) the stage of chromosome development in the nuclear cycle.

202. MEIOTIC CHROMOSOME BEHAVIOUR IN SPECIES, SPECIES HYBRIDS, HAPLOIDS, AND INDUCED POLYPLOIDS OF *Gossypium*. By J. O. Beasley. (*Genetics*, **27**, 1, 1942, p. 25. From *Exp. Sta. Rec.*, **87**, 2, 1942, p. 208.) The meiotic chromosome behaviour is regular in 13-chromosome species of *Gossypium*, but a few irregularities occur in 26-chromosome species. In meiosis of autopolyploids about two-thirds of the chromosomes form quadrivalents. In a haploid of a 26-chromosome species a maximum of five pairs of chromosomes was found. In hybrids between species, amount of chromosome pairing varies from complete to almost none. In hybrids with a reduced amount of pairing there was evidence that structural differences existed among some of the chromosomes, and in some species hybrids apparently all the chromosomes were structurally dissimilar. Most chromosomes formed bivalents in polyploids that were produced from hybrids with a reduced amount of chromosome pairing. Usually, however, cells in first metaphase and anaphase had one or more anomalies. The tetraploid species of *Gossypium* have one set of chromosomes similar to the set in Asiatic 13-chromosome species and the other set like that in American 13-chromosome species. The species of *Gossypium* are separated

into six general types chiefly on the basis of chromosome pairing, structure (arrangement of genes), and chromosome number. The degree of relationship of the types is discussed. Structural changes in the chromosomes probably had little importance in the initial speciation of *Gossypium*.

[*Cf.* Abstrs. **542, 543, 559,** Vol. XVII., **515,** Vol. XIX. of this Review.]

203. Cromosomios do Algodoeiro "Quebradinho." By O. C. Góes. (*An. 1ª Reun. Sul-Amer. Bot., Rio de J.*, 1938, **3**, p. 326. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 56.) The somatic number 52 was established in the variety Quebradinho, extensively grown in the north-east of Brazil, and it is thought to be related to the American group *G. hirsutum* L., *G. purpurascens* Poir. and *G. barbadense* L. Descriptions and illustrations of the chromosomes are given.

204. The Present Status of Synapsis and Chiasmatypy. By E. C. Jeffrey and E. J. Haertl. (*Amer. J. Bot. Suppl.*, 1941, **28.** From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 25.) The generally accepted view that the chromosomes pair side by side is apparently without sound foundation, since the meiotic chromosomes have exactly the same organization as the reproductive chromosomes, the chromosomes of the gametophyte, the endosperm, and the sporophyte. It is obvious, accordingly, that in the meiotic divisions there is a splitting of chromosomes, not a fusion. Consequently it seems inaccurate to speak of parasynapsis (conjugation); since parasynapsis does not take place, the chiasmatypy hypothesis ceases to be valid.

205. Amphidiploidy. By T. H. Goodspeed and M. V. Bradley. (*Bot. Rev.*, **8**, 1942, p. 271. From *Pl. Bre. Abs.*, xii., **1**, 1943, p. 25.) Discusses the origin of amphidiploidy and its experimental induction; the origin and character of naturally occurring amphidiploids; their morphological and physiological characteristics; the cytogenetics of amphidiploids; fertility and "crossability"; and the evolutionary significance and distribution of amphidiploids.

206. Ecological Significance of Polyploids. By H. Kihara. (*Study of Ecology*, **5**, 2, 1939, p. 147. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 231.) Reference is made to the findings of various investigators of the geographical distribution of polyploid plant forms and their relation to environment.

207. Cotton Fibres: Shrinkage and Cell-Wall Structure. By E. E. Berkley. (*Amer. J. Botany*, **29**, 1942, p. 416. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 510.) Longitudinal shrinkage of cotton fibres, when dried from the green to the air-dry and oven-dry conditions, was measured on seven varieties of *Gossypium hirsutum* and *G. barbadense* collected at frequent intervals beginning 10 days after the flowers opened. At the age of 10 days shrinkage was 35 to 40 per cent. From the 10-day period to the time of secondary thickening the shrinkage gradually decreased. Removal of waxes or pectic substances increased the shrinkage. There was a decrease in shrinkage when the fibres were dewaxed and then treated with boiling 1 per cent. caustic soda for one hour. Bundles of fibres containing primary wall only increased in length in 18 per cent. caustic soda; fibres containing secondary thickening decreased in length under this treatment. Fibres with primary walls only elongated in cuprammonium solution, but fibres with secondary thickening decreased in length. The results are held to confirm the microscopic and X-ray studies which show that the crystalline cellulose of the primary wall lies transverse to the long axis of the fibre or in a low spiral around the fibre. They also indicate that only a small percentage of the primary wall is crystalline cellulose.

208. Variations in the Length of Cotton Fibre in the Direction of Selection. By M. A. Ol'sanskii. (*Jarovizacija*, **2** (35), 1941, p. 101. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 261.) In 1934 lint length was measured in 42 F_4

plants from the cross Pioneer 915×Schroeder 1306; it varied in the different plants from 20·0 to 26·0 mm. The 42 F_5 families were sown separately and their mean lint length was 24·4 mm. The four best families with an average length of 24·8 mm. were selected. Further selection was repeated each year and raised the mean lint length to 31 mm. with variations from 28 to 35 mm. by 1940.

209. Influence of High Temperatures on Viability of Pollen in Cotton (in Relation to Premature Fruit Dropping). By S. S. Abaeva. (*C.R. [Doklady] Acad. Sci. U.S.S.R.*, **32**, 1941, p. 443. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 56.) The effect of high air temperatures under normal conditions of growth upon pollen viability (which may lead to premature shedding of the fruit) was studied with an Upland cotton No. 8517 and an Egyptian variety No. 35-1. Both varieties gave similar results. From a total of 30 determinations it was found that pollen from flowers that had been kept at a temperature over 41-42° C. failed to germinate on the stigma of a normal but previously emasculated flower. The best germination was obtained with pollen kept at 35-37° C. Owing to the time of incidence of high temperatures (over 40° C.) in cotton-growing districts in Russia (11-12 o'clock noon) and to dehiscence of the anthers of most of the flowers by 8 a.m., pollination can proceed normally, except in regions where unfavourable weather conditions may occur with effects resulting in too high temperatures and dry atmosphere throughout the morning hours.

210. Causes Underlying Bud and Boll Shedding in Cotton and Means to Control it. By V. A. Novikov. (*C.R. [Doklady] Acad. Sci. U.S.S.R.*, **32**, 1941, p. 148. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 56.) The physiological aspect of the problem mainly is discussed, as well as the results of studies of conditions and factors favourable to shedding, including transpiration. Varieties of cotton characterized by intense transpiration are stated to be likely to be more resistant to high temperatures and therefore less prone to shedding. Egyptian varieties shed less than American cottons. Measures that promote transpiration are recommended as a preventive of the defect. In breeding for non-shedding varieties special attention should, it is suggested, be paid to forms in which transpiration, rate of photosynthesis, and formation of vitamins are high, and the selected forms must also be characterized by high suction pressure of buds and bolls and by a well-developed root system such as is found in the Egyptian varieties.

211. Intra-varietal Crossing in Cotton. By K. I. Tsinda. (*Jarovizaciya*, **2** (35), 1941, p. 51. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 260.) The first generation from intra-varietal crosses in four varieties of *Gossypium barbadense* made in 1937 showed a greater energy of germination, and gave increases in yield of raw cotton varying between 1·45 and 5·44 c. per ha.; their yield was also of a higher quality, a greater proportion of it being picked before the frosts. Maarad gave the greatest yield increase, the variety 12761 the least, Pima and 2 Iz being intermediate. In the following generation differences in yield were still evident, and varied from 3·08 to 3·44 c. per ha. No difference was observed in size of boll, lint length or ginning percentage. The experiment was repeated in 1938 with Maarad, 2 Iz and three varieties of *G. hirsutum* L., 36 Me, 8517, and 1306. Local Turkmen material served in each case as maternal parent, and was pollinated from material reproduced elsewhere. This gave much greater yield increases than crosses between the local material. Maarad was especially improved as regards earliness by crossing. Different results were often obtained with material from different localities. The greatest differences were observed when the progenies were grown under the most favourable conditions.

212. Degeneration within Cotton Varieties. By J. F. O'Kelly. (*J. Amer. Soc. Agron.*, **34**, 1942, p. 782. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 56.) Standard

varieties of cotton were tested to determine what changes occur within the variety when mixing with others is prevented. No evidence was obtained that a variety of recent hybrid origin will change more rapidly than others.

213. Degeneration of Industrial Varieties of Cotton. By I. R. Krasovskii. (*Jarovizacija*, **2** (35), 1941, p. 47. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 260.) Descriptions are given of various off-types found in élite material of a number of cotton varieties. Many of them were sterile or of reduced fertility. The élites were grown under conditions designed to preclude out-pollination and the degeneration is ascribed to the élites being produced from the progenies of two or three single plants, which reduced their range of adaptability. A much larger number of plants is now taken as the basis for élite production so as to avoid this danger, and the application of intra-varietal crosses is recommended.

214. Withdrawal of Water from the Fruit by the Leaves of Cotton. By V. A. Novikov. (*Compt. Rend.* [*Dok.*] *Acad. Sci. U.S.S.R.*, n. ser., **32**, 4, 1941. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 30.) Results of the four tests reported appear to indicate that water is drawn from the bolls on wilting of the plant, and that the main part of it is absorbed by the leaves. The bolls of Egyptian cotton, containing more water than American varieties, suffered less from dehydration. The fact that Upland cotton has a tendency toward forming the abscission layer in the peduncle is explained partly on the basis of a high water loss from the bolls when the leaves are in need of it.

215. Breeding of a Cotton Immune from Natural Crossing. By S. C. Harland. (*Nature*, **151**, 1943, p. 307.) Balls (*The Cotton Plant in Egypt*, 1912) made the discovery that in the cotton plant, self pollen was somewhat prepotent over foreign pollen in interspecific crosses between Egyptian cotton (*Gossypium barbadense* L.) and Upland cotton (*G. hirsutum* L.). Thus if stigmas of *barbadense* were pollinated with a mixture of *barbadense* and *hirsutum* pollen, most of the ovules were fertilized with *barbadense*. The reverse was found with *hirsutum*. The prepotency of self pollen over foreign pollen was rediscovered by Jones some years later in maize, and other plants are now known to follow this rule. But Balls went farther and showed that some F_1 pollen was prepotent over self pollen, though he did not deduce any theoretical consequences from this fact. This observation made the writer believe that in an interspecific cross there must be segregation for velocity of pollen tube growth conditioned by minor modifiers (now called polygenes by Mather). If there were many minor genes for velocity it should be possible to concentrate them by stringent selection and produce new types in which self pollen grew so rapidly that no foreign pollen would grow fast enough to fertilize. The plan adopted was as follows, and the experiments lasted from 1929 to 1935, when the writer left Trinidad.

Upland: *y*, cream corolla.	*Barbadense*: *Y*, yellow corolla.
p, cream pollen.	*P*, yellow pollen.
s, spotless corolla X.	*Sf*, faint spot.
r, green plant body.	*R*, red plant body.

The F_1 showed dominance of *Y*, *P* and *R*. *Sf* could not be usefully employed because penetrance was too low.

The first backcross of F_1 on to the triple recessive hirsutum Upland. The female triple recessive was selfed at 8 a.m., much pollen being applied. Afterwards F_1 pollen was applied at intervals of one hour later, two hours later, etc., to eight hours later. Approximately ten bolls with roughly 210 seeds was the objective from each of the treatments. The nature of the results can only be given approximately owing to the loss of the writer's notes on leaving Trinidad. It was found that a considerable number of F_1 pollen tubes could beat the self tubes

even when the latter had four hours' start. A hundred plants were grown from each treatment, making eight hundred in all. Approximately eleven plants of composition *R, Y, P, r, y, p* were secured from the four-, five-, and six-hour treatments.

For the *second backcross* on to *hirsutum* triple recessive a mixture of pollen from all the eleven plants was used. Though the exact numbers are not available, the results indicate that a *much greater number of foreign tubes* were able to fertilize at the four-, five-, and six-hour intervals.

For the *third backcross* the pollen of ten *R Y P r y p* plants was mixed and applied at the same intervals after self-pollination. The number of plants from foreign pollen was slightly superior to the number in the second backcross, and the whole population was Upland in most of its characteristics.

The self population.—All plants resulting from the four-, five-, and six-hour treatments, about 60 in number, were self-fertilized and grown in progeny rows. All triple recessives were self-fertilized to create a series of lines identical with Upland except for the presence of the rapid pollen tube genes. Five plants only were available to continue the experiment. Progeny rows of these were interspersed among a collection of mixed hybrids of *hirsutum, barbadense* and *purpurascens* ancestry. If success had been obtained in concentrating some of the rapid pollen tube growth genes, some plants in these five rows would breed true to type *r y p* and vegetative characteristics, and could therefore be termed immune to natural crossing. The experiment was interrupted at this point, but has recently been resumed. Its practical importance for application to other crops is obvious.

216. Factors in the Breeding of Cotton for Increased Oil and Nitrogen Content. By N. I. Hancock. (*Tenn. Sta. Circ.*, 79, 1942. From *Exp. Sta. Rec.*, **87**, 5, 1942, p. 663.) Data from varietal studies with cotton in three localities in Tennessee are analysed and discussed in relation to factors involved in improvement by breeding of the oil and N contents of cottonseed. Both the oil and N content of cottonseed have been shown to be definite plant characters stable within the variety but differing significantly among varieties. The inverse relationship of the oil to N character is attributed largely to their non-compatibility with the environment—a wet, cloudy season being favourable to oil but unfavourable to N. Seasons appear to exert more influence upon this inverse relationship than do locations. The possibility of obtaining a variety high both in oil and N content is mentioned.

217. Cotton Breeding for Mechanical Harvesting. By H. P. Smith and D. T. Killough. (*Mech. Eng.*, **64**, 1942, p. 604. From *J. Text. Inst.*, November, 1942, A494.) Basic requirements of a mechanical cotton harvester are outlined and various plant characteristics that affect machine operation are listed. Difficulties of harvesting cotton mechanically and the influence of varietal and plant characteristics on the efficiency of mechanical harvesting are discussed. It is pointed out that an ideal plant type for all methods of harvesting is one having relatively short-noded fruiting branches 8 to 10 inches long, no vegetative branches, open-type growth, light foliage, storm resistance, and a medium to large strong boll borne singly on a peduncle that will snap easily under tension but will withstand plant agitation. Reference is made to suitable strains recently developed by cotton breeders at the Texas Station and to tests with the Texas Station harvester, which is of the stripper type.

[*Cf.* Abstr. **364**, Vol. XIX. of this Review.]

218. A Note on *Gossypium brevilanatum* Hoch. By J. B. Hutchinson. (*Trop. Agr.*, January, 1943, p. 4.) A strain of *Gossypium brevilanatum* Hochreutiner was established in 1939 at the Cotton Research Station, Trinidad, from seed supplied by Prof. Chevalier of the Musée d'Histoire Naturelle, Paris. This

interesting cotton relative is indigenous, but apparently rare, in Madagascar. After many unsuccessful attempts to obtain fresh seed, Prof. Chevalier kindly forwarded seed taken from herbarium specimens several years old. These germinated excellently, and a number of plants were obtained. In vegetative characters they resemble *G. kirkii* very much more closely than other species of *Gossypium*. The following is a description of the more important characters:

G. brevilanatum.—Woody shrub. In Trinidad growing to about 2 m. tall, usually unbranched until near the top. Stem not very strong, sprawling if left unsupported. Probably a sprawling shrub in its native habitat. Stipules small, falcate and persistent. Fruiting branches short sympodia, usually with three or four joints, bearing brilliant orange-yellow flowers. Bracteoles small (2 cm. or less). Flowers not widely expanding. Stigma lobes free, not dilated or capitate, not usually spreading. Capsules about twice as long as broad, usually 5-locular, surface irregularly pitted; hairs on the capsule sutures few and inconspicuous. Seeds 8 or 9 per loculus, covered with a single coat of fine light brown hairs up to 12 mm. long.

Chromosome counts were made in root tip material by R. M. Madoo. Root tips were fixed in "Craf" and stained in gentian violet. A typical plate is reproduced in the note as Fig. 1. The somatic chromosome number was found to be $2n=24$ (checked on 17 plates). A pair of long chromosomes was a marked feature of every plate examined. As was expected, *G. brevilanatum* agrees with *G. kirkii* in chromosome number, and not with the true cottons. Plates of *G. brevilanatum* were compared with Skovsted's preparations of *G. kirkii*. Apart from the occurrence of one pair of long chromosomes in *G. brevilanatum* there was little difference in chromosome size between the two species. *G. kirkii* and *G. brevilanatum* differ in a number of characters, the more important of which are tabulated below:

Character.	*G. kirkii.*	*G. brevilanatum.*
Stipules	Large, oblique, clasping stem.	Small, falcate.
Bracteoles	Almost as long as the petals.	Very much shorter than the petals.
Stigmas	Free, spreading.	Free, erect.
Capsules, shape ..	About as broad as long.	Half as broad as long.
Suture hairs ..	Copious, almost filling the cavity.	Few and inconspicuous.
Seeds per loculus	2	8-9

G. brevilanatum grafts easily on *G. kirkii*, but attempts to graft *G. aridum*, *G. arboreum*, *G. hirsutum* and *G. barbadense* on *G. brevilanatum* stocks all failed. (It is of interest to note that the Hawaiian *Kokia rockii*, which is a relative of *Gossypium* with 12 pairs of chromosomes, will graft on to *G. kirkii*. A good union results, but there does not appear to be free translocation from scion to stock, as the root dies unless a branch of *G. kirkii* is left.)

Attempts were made to obtain hybrids between *G. brevilanatum* and *G. kirkii*, and *G. brevilanatum* and cultivated New World cottons; 179 flowers of *G. kirkii* were pollinated by *G. brevilanatum*. The young bolls developed to some extent, but all fell off within about 2 weeks of pollination. At the same time attempts were made to cross two forms of *G. kirkii* that only differ slightly from each other; 46 flowers were pollinated, and all were shed within about 2 weeks. Since inter-crosses within *G. kirkii* failed, no great significance can be attached to the failure of crosses between *G. kirkii* and other species of *Gossypium*; 11 flowers of various types of *G. hirsutum* and 7 types of *G. barbadense* were also pollinated by *G. brevilanatum*; all were shed in 3 or 4 days.

219. Indian Cottons: Breeding for Wilt Resistance. (*Ind. Frmg.*, jii., 8, 1942, p. 442.) Investigations carried out at Dharwar have shown that cotton

wilt is primarily due to the parasitism of the soil-borne fungus, *Fusarium vasinfectum*, and that a close relationship exists between the disease and the soil temperature. The indigenous cottons are susceptible to the disease to a greater or lesser extent, while the exotic cottons have proved to be immune to it. As a result of work on the development of resistant varieties, indigenous varieties possessing desirable agricultural characteristics and showing a high degree of wilt-resistance have been produced and given out for general cultivation in each cotton-growing area where wilt is a serious problem. Some of the well-known resistant types produced by cotton breeders of the Agricultural Departments are Jayawant, which is grown in the Karnatak, Jarila in Khandesh, BD 8 in Broach, and Verum 434 in the Central Provinces and Berar. Experience has, however, shown that the conditioning factors of environment—viz., degree of soil infestation by the pathogen and soil temperature, which greatly modify the expression of the disease—vary from season to season, and that selection in the field, therefore, does not provide a final basis for sifting plants resistant to disease from those that escape it. A technique for the isolation of 100 per cent. wilt-resistant types under optimum conditions in a glasshouse specially fitted with temperature controls has been developed at Poona. It provides for the testing of strains in three stages—viz., the development of wilt-resistant strains of good quality and yield by the cotton breeders from wilt-sick plots; the testing of these at Poona under optimum conditions of infection, and reselection of immune types from the highly resistant material furnished by the breeders; the final testing of strains selected at Poona in the respective tracts for wilt immunity and other agronomic characters. Tests over a series of seasons have shown that strains from both Broach and Jalgaon have now reached a stage when they may be said to be 100 per cent. resistant to wilt, and it is expected that within a short time wilt-immune types will be available for distribution in the tracts of Bombay and the neighbouring States affected by the disease.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

220. An Introduction to the Chemistry of Cellulose. By J. T. Marsh and F. C. Wood. (Chapman and Hall, Ltd., London, 1942. Price 28s. Reviewed in *Bull. Imp. Inst.*, xl., **3**, 1942, p. 207.) The first edition of this book was published in 1938, but since that date many further developments have taken place in cellulose chemistry which have been incorporated in this second edition. It is intended as a relatively simple guide to the younger chemists who are entering those branches of industry which are concerned with cellulose, such as the textile industry, paper-making, and rayon manufacture, and admirably meets their requirements. It is essentially a survey of the enormous literature on the subject, the references to which are given in the text as the occasion arises and not in a separate bibliography. The subject matter is dealt with in five parts, covering respectively: the occurrence and general properties of cellulose; its constitution and structure; dispersed cellulose including mercerizing; modified cellulose—*i.e.*, the effects of acids, alkalis and oxidation; and finally the derivatives of cellulose, including the various esters and ethers, as well as rayon manufacture. Every aspect of this important subject is covered in the book, which can be thoroughly recommended as an up-to-date treatise, not only for the young research worker, but, as Sir Kenneth Lee says in his Foreword, for those concerned with industrial production and process control who have no time to read the original literature.

221. Cellulose: Solution in Neutral Salt Solutions. By — Haller. (*Klepzig's Textil-Z.*, **44**, 1941, p. 645. From *Summ. Curr. Lit.*, xxii., **22**, 1942, p. 535.) A sample of cotton was heated in a saturated solution of lithium

chloride; at 80° the fibres assumed a glassy appearance, at 120° the cotton swelled markedly, at 150° it lost its structure, and at 160° lost its cohesion. On cooling, the mass became a crystalline solid. A detailed chemical analysis showed that the cotton had undergone hydrolysis and that lithium chloride is not a solvent for cellulose under these conditions. Cotton was subjected to sodium iodide solution at 130° for 5 hours in a bomb. Weighing the sample before and after this treatment as well as a microscopic analysis showed no change. A sample of cotton extracted with petroleum ether and boiled with lime and alkali was subjected to potassium mercury iodide reagent at low and elevated temperatures; no solution of the cellulose was observed. Cotton was pretreated with fuming nitric acid, acetic acid and caustic soda (36° Bé) for 24 hours, washed free from acid or base and then placed in potassium thiocyanate or potassium mercury iodide reagent at low and elevated temperature; it did not undergo any change. Cotton was pretreated with hydrochloric acid of various concentrations and, without washing, was subjected to potassium thiocyanate, lithium chloride and potassium mercury chloride reagent, respectively; the results were negative, even on heating and boiling. Purified cotton fibre was refluxed for 7 hours with hot saturated solutions of potassium iodide and lithium iodide, respectively. Potassium iodide caused a distinct swelling of the cotton in a relatively short period, whereas lithium iodide required more time to cause the same extent of swelling. There was no indication of any solution of the fibre; the weight losses were 0·3 per cent and 0·5 per cent. in lithium iodide and potassium iodide, respectively. When these tests were repeated with calcium thiocyanate and potassium iodide by heating the cotton and the solution in a metal bomb to 110°, the cotton merely swelled without going into solution or losing any weight. A repetition of the calcium thiocyanate test, in which cotton was heated with an excess of a saturated solution for 5 hours at 120°, yielded a gel-like transparent mass. An analysis of this mass showed that hydrocellulose was formed. The author concludes that aqueous solutions of neutral salts do not dissolve cotton without chemical change. Whenever the cotton actually goes into solution the dissolved product is not unaltered cellulose.

222. Rôle of Velocity Gradient in Determining the Cuprammonium Fluidity of Cellulose. By C. M. Conrad. (*Ind. Eng. Chem.*, Anal. Ed., xiii., **8**, 1941, p. 526. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 753.) In a study of methods of expressing the results of moderately to highly anomalous solutions, such as 0·5 per cent. cuprammonium solutions of undeteriorated cotton cellulose, the velocity gradient at which the measurement is made was found to be an important factor. The most promising procedure for anomalous solutions consists in obtaining fluidity or viscosity readings at several velocity gradients and then interpolating the results logarithmically to some common mean velocity gradient. Methods for varying the mean velocity gradient are suggested. A mean velocity gradient of 500 sec.$^{-1}$ is recommended as convenient of attainment in ordinary capillary viscometers and probably representative of gradients for which results of anomalous solutions have been recorded. The adoption of a common mean velocity gradient for expression of the results of anomalous solutions will not only eliminate instrument errors but will provide a unique value for any given substance. Methods are suggested for relating this to the molecular weight.

223. Determining the Deterioration of Cellulose caused by Fungi: Improvements in Methods. By G. A. Greathouse *et al.* (*Ind. Eng. Chem.*, Anal. Ed., xiv., **8**, 1942, p. 614. From *Rev. App. Mycol.*, xxii., **2**, 1943, p. 73.) At the Bureau of Home Economics, Department of Agriculture, Washington, D.C., the authors developed a standardized quantitative method for the estima-

tion of fungal decomposition of cellulose, the material selected for the experimental work being bleached, degreased, 8-oz. Army cotton duck, cut into strips and cultured on a liquid medium, the formula for which is given.

Metarrhizium sp. and *Chætomium globosum* were found to cause very rapid decomposition of the material, the loss in breaking strength of the fabric after seven days through the action of these fungi being estimated at 94·9 and 81·5 per cent., respectively. As test organisms for the purpose in view they are superior to *C. elatum*, *Alternaria* sp., *Cladosporium* sp., and *Stachybotrys papyrogena*. The hydrogen-ion concentration of the substratum appears to exert a strong influence on the activity of the cellulose-destroying fungi, all of which, except *Chætomium globosum*, caused a greater loss in breaking strength at *p*H 7 or less.

224. Cellulose Fibres: Structure. By W. Marquette. (*Rayon Text. Mnthly.*, **23**, 1942, p. 518. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 566.) The findings of Farr and co-workers and various criticisms and confirmations of these findings are reviewed. The possibility of using the electron microscope for studying the structure of cellulose particles is discussed and it is pointed out that many of the micrographs of cellulosic materials so far recorded with the electron microscope represent ash constituents or some other similarly opaque materials of incinerated fibres rather than the structure of the cellulose itself.

225. Cellulosic Fibres: Action of Light on. (*Text. Wkly.*, **30**, 1942, p. 164. From *J. Text. Inst.*, October, 1942, A453.) When cellulose is exposed to ultra-violet rays for a short time there is, at first, no breakdown of the cellulose with formation of oxycellulose, but polymerization occurs denoted by a decrease in the copper number and an increase in tensile strength of the fibres so treated. Solubility in the usual solvents for cellulose is considerably reduced and esterification is difficult. Illumination of solutions of cellulose derivatives for a short time with ultra-violet rays produces a decrease in viscosity, except in the case of ethyl cellulose. Cotton illuminated by a quartz-mercury lamp of 110 volts at a distance of 15·2 cm. for a period of 0·8 sec. shows an increase in strength of about 20 per cent. If ultra-violet rays are permitted to act for longer periods, breakdown of the cellulose substance occurs with formation of oxycellulose. The effect is not constant for any particular cellulosic fibre, but depends on the surface construction of the latter and on its pre- and after-treatment.

226. Raw Cotton: Analysis for Cellulose. By J. H. Kettering and C. M. Conrad. (*Ind. Eng. Chem.*, Anal. Ed., **14**, 1942, p. 432. From *J. Text. Inst.*, September, 1942, A409.) The raw cotton (10 gm. or less) is extracted with alcohol (Soxhlet, 4 hours) and samples (0·1 gm.) are then digested with 1 per cent. caustic soda (100 c.c.), the residual cellulose is oxidized by acid dichromate, and the unused oxidant is titrated with ferrous ammonium sulphate, using *o*-phenanthroline indicator, over a ground-glass plate beneath which is an electric light. Details are given. In comparative analyses of ten different cottons, the results obtained were slightly higher than by a semimicro-adaptation of the Norman and Jenkins procedure and lower than those obtained by a similar adaptation of the Reid, Nelson and Aronovsky ethanolamine procedure. The proposed method is recommended particularly for the determination of the cellulose content of raw cotton and may be used in analyses of desized fabrics. It is not suitable for cellulose materials which contain lignin.

227. Cotton: Structure and Properties. By R. F. Nickerson. (*Ind. Eng. Chem.*, **34**, 1942, p. 1149. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 566.) A general account is given of the structure and properties of the cotton fibre and of the effects of moisture, heat and stresses. Explanations of the behaviour of the fibre in terms of hydrogen bonding between cellulose chains and between internal

fibre surfaces are suggested. Mercerization, crease-resistance, mildewing, and the behaviour of cotton in tyre cord are discussed.

228. FIBRES: EXAMINATION UNDER THE POLARIZING MICROSCOPE. By A. Herzog. (*Textilberichte*, **21**, 1940, p. 97. From *J. Text. Inst.*, October, 1942, A452.) The original German paper describes a complete system for the examination of fibres by means of the polarizing microscope.

229. THE STAPLE LENGTH OF COTTON. By E. Lord. (*J. Text. Inst.*, December, 1942, T205.) The purpose of the work described in this paper is to investigate the relationship between the lengths of staple measured by the American Standards, by practical spinners in this country, and by the sorter diagram method used in the laboratory. The first part of the paper is devoted to a study of 24 samples of cotton, 20 of American Upland type and 4 of American-Egyptian. These form a complete set of the official standards issued by the U.S. Department of Agriculture and cover the whole range of lengths of American cottons. Stapling tests were made on the comb sorter and the nominal lengths of the Standards were compared with the lengths obtained from the sorter diagrams. In the second part of the paper the results of hand stapling tests made by brokers and spinners are compared with those obtained from the sorter diagram.

It is shown that the *Effective Length* is closely related to the nominal staple length of the American Standards. The relationship is not linear, and for all American types the effective length is the larger quantity. Near the extreme end of the scale—that is, for the long American-Egyptian types—the two quantities approach equality. A table is provided so that the effective length can be translated into the corresponding staple length of the Standard. In cases where the highest accuracy is not required, the subtraction of $\frac{3}{32}$ inch from the effective length gives the American staple. The consistent error which may arise by the use of this simple rule will not exceed $\frac{3}{32}$ inch within the range of staples encountered in American Upland cotton. The *Modal Length* would not be expected to agree exactly with the staple length because of the rejection of short fibre that occurs during hand stapling. By suitable transformation of the fibre distribution, chosen to reduce the effect of short fibre, a modified measure of modal tendency has been calculated from the results of the sorter diagrams. This quantity, termed the *Doubly Weighted Mode*, is closely related to the American Staple. For the American Upland types it is always the longer quantity, the excess being about $\frac{1}{32}$ inch for $\frac{7}{8}$ inch staple, increasing to $\frac{3}{32}$ inch for $1\frac{1}{4}$ inch staple. By a construction similar to that used in the determination of effective length, a quantity has been calculated to give a median measure of fibre length in a sorter diagram. This *Modified Median* does not correspond to the actual median length of fibres in the diagram—it is designed to eliminate the effect of short fibre, but it is found to be closely related to the staple length. It is about $\frac{1}{16}$ inch longer than the American Standards for cottons up to a length of about $1\frac{5}{16}$ inch. Other length characteristics of sorter diagrams have been investigated, but these provide less accurate estimates of staple length than those already given. A poor relationship with American staple is obtained if the length characteristic is unduly affected by the presence of a small percentage of excessively long fibre, or by short fibre, quantities that have no appreciable effect on staple length obtained by hand stapling methods. The *Mean Length* is such a characteristic.

The hand stapling experiment described in the second part of the paper was made possible by the co-operation of two brokers and 90 spinning concerns. Over 1,000 samples of cotton were stapled, the different varieties ranging from short Bengals to the longest Sea Island and covering nearly all the main types in general use. In both instances the brokers' results average a little higher than

the American Standards, although the difference is small, three-quarters of $\frac{1}{32}$ inch for Broker A and half of $\frac{1}{32}$ inch for Broker B. For convenience of reference a table is included giving a summary of the average levels of stapling in the three sections of the trade (American, Egyptian and General). The table only gives the general tendency. As pointed out later in the article, the average level of stapling by an individual firm may consistently deviate by as much as $\frac{1}{8}$ inch from the corresponding level of the section of the trade to which it belongs.

In the trade it is recognized that the so-called Liverpool Standards represent staple lengths of $\frac{1}{8}$ inch longer than the corresponding classification based on the American Standards. It follows from the results given above that the average level of classification in the American section of the industry is $\frac{1}{8}$ inch below the Liverpool Standards, that the General section of the trade staple is on an intermediate level, and that the Egyptian section tend to staple on the same baiss as the Liverpool Standards.

230. COTTON LINT: CLEANING. South Texas Cotton Oil Co., Inc., Houston, Texas. (U.S.P. 2,274,385. From *Summ. Curr. Lit.*, xxiii., **1**, 1943, p. 3.) A process for cleaning cotton lint includes successive agitating and tumbling steps over grids, whereby dirt and short fibre are sifted out and retained for further sifting, discharging the clean lint into a stream of air, of sufficient force to carry lint along but to drop the heavier dirt and trash, repeating the process on the clean lint, and blending it into a uniform mixture.

231. COTTON FABRICS: EFFECT OF DESIZING, DYEING AND FINISHING ON STRENGTH. (*Ciba Rev.*, **4**, 1941, p. 1455. From *Summ. Curr. Lit.*, xxii., **11**, 1942, p. 259.) The various chemical and mechanical influences to which printed materials are subjected during processing cause considerable alterations in the mechanical properties of the raw material. Desizing removes certain substances which were introduced into the fibre artificially, and natural substances associated with the cotton fibre are removed during the boiling-out process. Data are given for the mean of five determinations made on dyed material which had been printed with a white discharge. By desizing the tensile strength of the weft is reduced by more than 20 per cent., whilst the warp (the only sized thread in this case) is scarcely altered in its mechanical properties by the removal of the size. The greater loss in tensile strength of the weft is due to the lower degree of twist in the yarn, which has been loosened by this first wet treatment and thus offers less resistance to tension. With a normal loss of substance, boiling-out causes a noticeable increase in warp strength, whilst the weft strength shows a small increase in comparison with the desized weft. In contrast to desizing, dyeing increases the tensile strength of the fabric in warp and weft, probably owing to the addition or absorption of dye leading to an increase in substance of the cloth and a decrease in the length of material due to shrinkage. The effect of the printing process on the tensile strength of the material is similar to that of dyeing. Finishing operations cause considerable increases in tensile strength which, however, are only temporary and disappear when the material is washed. This increase is due to the stiffening of the threads by the added finishing agents, which cause an appreciable addition to the substance of the substrate.

232. COMPARISON OF FABRIC TENSILE TEST RESULTS OBTAINED IN DIFFERENT LABORATORIES. By B. D. Porritt *et al.* (*J. Text. Inst.*, June, 1942, S9.) Information has been collected on the machines and test conditions used by a number of laboratories in the rubber industry for the tensile testing of fabrics, and on the conditioning treatment given to the specimens. The information obtained is tabulated and briefly discussed. The results are given of tests on samples of the same nine cotton fabrics by eighteen of the laboratories, which were requested to condition the specimens and carry out the tests under specified

and substantially uniform conditions. Data for the breaking load, breaking elongation, and elongation at 200 lb. load of the nine fabrics, which ranged from light sheeting to stout belting duck, are tabulated and discussed. It is shown that with all three properties the variation between different laboratories' results for the same fabric is much greater than could reasonably be ascribed to the variability of the fabric and the random errors of sampling and testing. Thus, among the eighteen laboratories there is a range of variation of about 25 per cent. in breaking load and 50-60 per cent. in breaking elongation and elongation at 200 lb., whereas if all the tests had been made under absolutely the same conditions the variation would have been only about 5-6 per cent. in each case.

233. COTTON MATERIALS: VOLUMETRIC DETERMINATION OF MOISTURE CONTENT. By J. F. Keating and W. M. Scott. (*Amer. Dyes. Rpt.*, **31**, 1942, p. 308. From *J. Text. Inst.*, October, 1942, A453.) A report is given of a study of the application to the determination of the moisture regain of textiles of the volumetric method which depends on cold extraction with methanol and subsequent titration of the water with Karl Fischer's reagent (a mixture of iodine, sulphur dioxide and pyridine in methanol). Details of the procedure and of the preparation and stability of the reagent are included. Moisture regain values obtained by the oven-drying and titration methods are given for a number of representative cotton fabrics.

234. MERCERIZING. By J. T. Marsh. (Chapman and Hall, Ltd., London, 1941. Price 32s. Reviewed *Bull. Imp. Inst.*, xl., **3**, 1942, p. 207.) Nearly 100 years ago Mercer patented his process for the treatment of cotton with caustic soda, and 50 years later Lowe produced the silky lustre of what is now called mercerized cotton by treating the fibre whilst under tension. In the succeeding years more has been written about this aspect of cellulose chemistry than almost any other. Most of this work has been published in the scientific and technical press, and the last complete treatise in English appeared nearly 40 years ago. Mr. Marsh has, therefore, performed a most useful task in compiling the present work, which brings together the results of the latest researches in the subject. After an introduction dealing with the life and work of Mercer and Lowe, the fundamental characters of the cotton hair are discussed, followed by accounts of the mercerizing process and description of the plant used, and of the structure of cellulose and the effects of mercerizing on that structure. Then follows a discussion of the theoretical aspects of the action of alkali on the fibre and of absorptive capacity. The last part is concerned with more practical matters, including tests for the efficiency of the process and a diagnosis of the faults which may arise in the final product. Although naturally in the main concerned with the mercerization of cotton the author also gives an account of the process in relation to rayon and linen. The book is extremely well produced, with an abundance of illustrations, including a number of microphotographs.

235. MERCERIZED COTTON: MICRO-CHEMICAL TESTING. By A. V. Surovaya. (*Khlopchato Bumazhnaya Prom.*, **11**, 1939, p. 37. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 510.) Moisten with alcohol a bundle of 30-50 threads approximately 15 cm. long, treat with base and dye with Anil Pure Blue FF. Cut the threads to a length of 0·5-0·6 cm., place in glycerol between two object glasses, and count under the microscope the number of mercerized (cylindrical rod) and unmercerized (twisted ribbon) fibres. The coefficient of mercerization is the ratio of the percentage of the mercerized fibres in the factory sample to that in a sample after repeated mercerization.

236. COTTON NEPS: PREVENTION. (*Text. World*, **92**, 8, 1942, p. 99. From *J. Text. Inst.*, November, 1942, A499.) Briefly discusses the respective contributions of carding, weaving and dyeing to the problem of neps in American army twill.

Card settings and speeds are recommended. Perforated tin cloth rollers should be replaced by rubber-covered rollers on the loom. The procedure in dyeing should aim at good penetration.

237. COTTON SPINNING COSTS: DETERMINATION. (*Text. Wkly.*, **30**, 1942, p. 564. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 606.) The determination of costs in cotton spinning is discussed, and it is pointed out that in a mill producing a standard count the cost per pound is given by the ratio total costs/dry yarn produced, not by total costs/weight of cotton mixed. In order that the processes may bear their proportionate share of the cost, it is convenient to express the productions in terms of the weight of dry yarn they produce, and to adjust the total cost of producing 1 lb. of dry yarn by the regain percentage. The dry yarn productions are determined by multiplying the actual machine productions by constants. There will be appropriate constants for each particular quality and the constants will vary according to the waste taken out at each process.

238. POST-WAR MODERN COTTON SPINNING. By J. Buckley. (*Text. Mnfr.*, lxix., February, 1943, p. 65.) Part I deals with Modern Cotton Spinning Machines and Methods.

239. TEXTILE FIBRES: MICROSCOPY. By W. Krauss. (*Rayon Text. Mnthly.*, **23**, 1942, p. 599. From *Summ. Curr. Lit.*, xxiii., **1**, 1943, p. 16.) An account of the use of the microscope in (1) the identification of textile fibres, (2) the quantitative analysis of fibres in mixtures, (3) the determination of the quality of fibres, and (4) the identification of damage to the fibres incurred during processing, in storage, or while in the possession of the customer. Specific cases are discussed and photomicrographs of various types of fibres and of fibres damaged by moths, burning, deodorants and silver fish are reproduced.

240. TEXTILE MATERIALS: MOISTURE CONTENT TITRATION. By L. Stanhope. (*Text. Rec.*, **60**, 1942, p. 41. From *Summ. Curr. Lit.*, xxii., **20**, 1942, p. 478.) The use of the Fischer reagent for the determination of moisture is discussed. The preparation of the reagent is described and the method of use recommended by Mitchell for the determination of moisture in fibrous materials such as cotton, paper or regenerated cellulose rayon is outlined. The work of Keating and Scott is discussed and essential features of the potentiometric method of determining the end point proposed by Almy, Griffin and Wilcox are noted.

241. TEXTILE TESTING: PHYSICAL, CHEMICAL AND MICROSCOPICAL. By J. H. Skinkle. (Macmillan and Co., Ltd., London. Chemical Pubg. Co. Inc., New York. 1940. Price 15s. Reviewed *Bull. Imp. Inst.*, xl., **3**, 1942, p. 207.) The author is Assistant Professor of Textile Chemistry, Lowell Textile Institute. The most satisfactory sections are those on the physical testing of fibres, yarns and fabrics and on the chemical tests to be applied to determine the nature of fibres and on damage to cellulose fibres, wool, and silk. These should be very helpful to both manufacturers and consumers. Part III on microscopical testing is too brief to be of much value, occupying less than 12 pages, plus a few tables giving the microscopical appearance of some starches, hairs, bast fibres, artificial fibres, etc. A large number of references to literature are given throughout the book, and there are numerous illustrations, but it is unfortunate that the paper used is unsuitable for the reproduction of half-tone blocks.

242. RESEARCH AIDS: AIR PERMEABILITY INSTRUMENT. (*Text. Res.*, **12**, 7, 1942, p. 20. From *Exp. Sta. Rec.*, **87**, 5, 1942, p. 753.) The improved instrument, described and illustrated, was developed at the National Bureau of Standards by H. F. Schiefer and P. M. Boyland. It permits a determination to be made on any part of a piece of cloth without cutting. Having been found entirely satisfactory in routine use, it is recommended for testing parachute cloth, fabrics

for wind-resistant clothing, blankets, etc. In the test the fabric is held firmly over a very small opening mounted in a table top. Air is drawn, at a rate which may be adjusted, through the fabric into a chamber connected with a horizontal manometer for measuring the pressure drop across the fabric and through an orifice for measuring air flow into a chamber connected with a vertical manometer. The amount of air flowing through a fabric under test is determined from the pressure drop indicated by the vertical manometer and the calibration of the orifice which is used. A set of nine orifices covers the range of air permeability from 1 to 700 cu. ft. per minute per square foot of fabric. The air permeability is usually measured for a pressure drop across the fabric of 0·5 per cent. of water. The appropriate size of the orifice to use for a fabric, the approximate permeability of which is not known, is determined by a trial run. The pressure drop indicated by the vertical manometer should be more than 3 inches. If it is less, a smaller orifice should be used to obtain precision in the instrument.

243. Internal Reorganization of a Cotton Mill. By J. Airey. (*J. Text. Inst.*, December, 1942, p. 124.) The author makes suggestions for improvements in mixing and blowing, carding, draw frame and speed frame, spinning, winding and beaming, conditioning, doubling and twisting, and weaving processes with a view to the redistribution of labour and improving wages and reducing costs. Estimates are given of the savings that could be effected if some of the suggested improvements were adopted.

244. Recruitment, Selection and Training for the Textile Industry. (*J. Text. Inst.*, December, 1942, p. 119.) Reasons are discussed for the shortage of male juvenile labour in the textile industry, and the need is stressed for making conditions and prospects in the industry more attractive. The selection and training of suitable young workers is also dealt with, and better co-operation between industrial and education authorities is advocated. The following is a summary of the recommendations made: (1) The modernizing of premises and the improvement of general working conditions should be encouraged. (2) Post-war arrangements should aim at reducing the sharp fluctuations in prosperity that have marked the industry in the past. (3) The claims of the industry and clear outlines of possible careers in it should be made known in the schools by attractive propaganda. (4) Contacts between the industry and the schools should be established by means of visits to mills by children and educationists and return visits by suitable representatives of the industry to the schools. (5) Teachers in textile areas should be expected to make themselves acquainted with actual conditions in the industry, and to keep industrial applications in mind when framing schemes of study. They should be shown that factory life need not be either inferior or degrading. (6) Recruitment should keep step with educational organization, the outlines of which should be made clear to employers. Arrangements should be made to admit in proper proportions three streams of recruits: (*a*) at the statutory school-leaving age; (*b*) from secondary and junior technical schools at from 16 to 18 years of age; (c) from universities and higher technical institutions; and to discriminate between them so that the industry may reap the full advantage of the abilities of each stream. (7) The industry should consider the merits of the junior technical school with a view to the establishment of more schools of this type. (8) More general attention should be given to fitting the youth and the job, whether operative or executive, and to making him understand his place in the industrial organization. (9) The training of the personnel is an industrial responsibility. In this matter the technical institutions are at the service of the industry. It is the duty of the industry to decide upon the elements of the training it requires for each section of its employees and to define the shares in it of the industry

and the technical institution. Trainees should be given proper facilities in the works and for attendance at the technical institution, including time off during the day and adequate recognition of outstanding success. An outline is given of a suggested scheme of training.

245. COTTON WORKERS: TECHNICAL EDUCATION. By J. E. Richardson. (*Text. Wkly.*, **30**, 1942, p. 591. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 607.) The place of technical education in the educational system and the development and work of technical colleges and junior technical schools are discussed. The needs of the cotton industry are examined and it is pointed out that, although the industry is adequately provided with well-equipped colleges, experienced teachers and reliable examining bodies, there has been a disastrous fall in the number of male entrants to the mills and in the number of students in training. The need for making the industry more attractive to young people is emphasized, and suggestions are made regarding the classification of entrants and schemes of apprenticeship or traineeship. It is recommended that juvenile labour should be regarded as only partly productive and partly as under training. In such a system the junior technical school would play an important part.

TRADE, PRICES, NEW USES.

246. BRITISH COTTON INDUSTRY: PRESENT CONDITIONS AND POST-WAR REORGANIZATION. (*Times Trade and Eng.*, **52**, 947, 1943, p. 42. From *Summ. Curr. Lit.*, xxiii., **4**, 1943, p. 110.) Reference is made to recent preliminary discussions of post-war organization, and it is pointed out that these have revealed fairly general agreement that some form of control will be necessary, at any rate for a limited period after the war, and that most producers will favour the continuance of some form of controlled prices for both yarn and cloth. Applications for increases in wages in various sections are discussed, and the effects of the latest agreements are explained. It is pointed out that the mills now left open (the nucleus mills) have, during the past year, met with a larger demand, at profitable rates, than they have been able to accept. Almost without exception the mills have not been able to keep the whole of their licensed spindles and looms running full time owing to the scarcity of labour. Government demands are increasing and the utility programme also makes heavy demands, so that not much scope is left for exports.

247. COTTON INDUSTRY ORGANIZATION NOW AND AFTER THE WAR. (*Text. Mnfr.*, lxviii., November, 1942, p. 425.) Sir Raymond Streat, Chairman of the Cotton Board, in an address given at the Rochdale Rotary Club in October last, outlined the possible scope of post-war control and many items of domestic cotton industry policy. He said his faith was that it was entirely possible, and from a national standpoint vitally necessary, to have a prosperous cotton industry in Lancashire after the war. He believed that as firmly as in victory, but both required sound, well-timed policies, coupled with brave and energetic action. After the war industry will face a changed world, and the first necessity will be to equip ourselves with a new conception of the rôle of industry in the community. The most vital of the foundation stones will be the moral and spiritual convictions chosen. Nevertheless we must adopt objectives also in materialistic terms, and in that realm success for the cotton industry may be defined as trade enough to occupy the mills now running and mills now closed at prices sufficient to make conditions of employment what they should be and profits satisfactory. Home-market demand, including various new uses for cotton, ought to be good, but it will be vital also to national ability to pay for essential imports that cotton should succeed in obtaining a substantial export trade. Doubtless for a short period after the war there will be a great

shortage, and people will buy what is offered, but let us beware of building again any policy and plans on the false impressions created by a scarcity boom. Success will depend on three factors: (1) A sound Government policy for international trade agreements; (2) ability to produce at competitive prices; and (3) a good selling organization.

248. The Cotton Industry in the Reconstruction and Post-War Period. By Col. W. A. Grierson. (*J. Text. Inst.*, November, 1942, p. 106.) A report of a lecture given to the Lancashire Section in Manchester in September last. The lecturer stated that the main economic problems of the future are distribution and consumption, and in his view these two interrelated problems can be solved by the setting up of an international organization of product distribution—by balancing supply and demand with the object of achieving total annual disposal of each product, whether agricultural, raw material or industrial. An outline of such an organization was given.

249. Cotton Control: Now and Post-War. (*Text. Mnfr.*, lxix., January, 1943, p. 5.) In an address to the Oldham Cotton Mill Managers' Association, Sir Frank Platt, the Cotton Controller, explained some inevitable steps in war-time cotton control, and gave personal views on future problems, especially those relating to the cotton-spinning sections. The subject was dealt with under the headings of Raw Cotton; Planned Production; Wages; Post-War Control; Merchants' Future. Sir Frank Platt concluded his address with the following words: "I am not afraid of the future of our great industry. There is a great deal of thought and attention being given to that future by all our friends within and without the trade."

250. Cotton: Applications. By D. M. Ellis and E. L. Day. (*U.S. Dpt. Agr., Agr. Econ. Bibliog.*, **91**, 1941. From *Summ. Curr. Lit.*, xxii., **22**, 1942, p. 526.) A selected bibliography of 785 references, in English, during 1933-40 on "Uses for Cotton," classified under 39 headings. The annotations are followed by an index.

251. Cotton Goods: Quality Control. By L. H. C. Tippett. (*Text. Wkly.*, **30**, 1942, p. 622. From *Summ. Curr. Lit.*, xxiii., **1**, 1943, p. 16.) Quality control by means of statistical records, its general advantages, points of possible application in the cotton industry, and the probable effects of such applications are briefly discussed.

252. Cotton Trade: Post-War Economics. By D. Windel. (*Text. Wkly.*, **31**, 14, 1943, p. 16. From *Summ. Curr. Lit.*, xxiii., **2**, 1943, p. 50.) A report of a lecture reviewing pre-war conditions and making proposals for post-war reconstruction. The proposals include the establishment of an International Central Authority which would (*a*) establish an international currency, (*b*) decide upon a common international language, (*c*) organize the production and distribution of staple primary products in accordance with broad national needs, (*d*) stabilize prices of such products throughout the world in terms of the international currency, (*e*) organize at a later stage the production and distribution of manufactured goods of standard and constant utility, and (*f*) raise living standards in backward countries.

253. Cotton Supply and Markets. By J. A. Todd. (*Text. Mnfr.*, lxviii., 1942. June and subsequent numbers.) This is a continuation of the series of articles commenced in June of last year, giving month by month a review of the cotton situation at home, in the United States, India, Egypt, and South America. The most recent article (March) states that no developments of vast-

standing interest took place in the raw cotton section at home during February. The Cotton Control made no releases of raw cotton cargoes for free distribution, but continued its policy of unofficially allocating limited quantities of various growths to designated spinners from the reserve store. Personnel in the Liverpool market has been further depleted by calling-up for war work, and few firms have now more than a skeleton staff. The reduction of 1d. per lb. in price of cottons by the Cotton Control will involve a reduction in the profits derived by the Minister of Supply from importation and distribution. At the present relative level of prices there should still be a moderate profit on imports of Egyptian, Sudan, Belgian Congo and West African cottons. Imports of better-stapled East Indian varieties, however, will involve a loss of about 4d. per lb., and there will be little or no profit on imports of South American cottons.

United States.—Business in the American cotton markets during February remained quiet, but the trend of prices continued upwards, and the highest levels of the war-time movement were reached in the last week of the month. Nearby futures deliveries rose to around 20·50 cents or nearly a cent per lb. over the February parity figure of 19·59 cents. January consumption of all kinds of cotton by the United States mills amounted to 915,000 bales, compared with 948,000 bales in January, 1942. This moderate decline in consumption is due partly to the movement of labour to the Services and better-paid war industries, and partly to temporary stoppages arising out of the strain and stress on machinery. During February the demand for textiles continued in excess of production. Government purchases of cloth for the Services, Lend-Lease, and war aid were substantial, necessitating a further curtailment of offers to the civilian home market. The Secretary for Agriculture has asked farmers to plant up to their full 1943 cotton acreage allotment. It is doubtful, however, whether more than 23,000,000 acres will be planted owing to the shortage of labour and to the tendency to devote more land to soya beans and other food crops.

Egypt.—No Government announcement regarding the 1943 acreage has yet been made, but the opinion is expressed from Alexandria that the area planted will be no larger than in 1942. Exports to Great Britain and the United States have been unimportant, but shipments to India have been resumed on a restricted scale.

India.—The trend of the Bombay market during February continued strongly upward despite domestic political unsettlement. General inflationary influences appeared primarily responsible, though other factors were the keen demand from domestic spinners for all better staple cottons, the record high rate of domestic mill consumption, heavily reduced imports of foreign cottons, and talk of a further big reduction in the 1943 cotton acreage to meet the need for greater production of foodstuffs. Of the prospective 1942-43 cotton crop of around 5,000,000 bales, domestic mills will probably consume about 4,200,000 bales. Exports will possibly be from 300,000 to 400,000 bales, compared with nearly 1,000,000 bales last season. Lack of shipping and the relative dearness of better Indian cottons to other competitive growths are mainly responsible for the poor export prospect.

South America.—The cotton acreage of Argentina is officially estimated at 899,229 acres, against 815,463 acres last season. The area under cotton in South Brazil is estimated to be slightly larger than a year ago. On present prospects a crop of between 1,700,000 and 2,000,000 bales is predicted in São Paulo trade circles. The Peruvian cotton acreage is about the same as the 1941-42 season. Crop prospects to date are satisfactory. No agreement has yet been reached between the Peruvian and United States Governments in regard to buying rates for the coming crop.

MISCELLANEOUS.

254. SKINNER'S COTTON TRADE DIRECTORY OF THE WORLD, 1942-43. (Pubd. annually by Thos. Skinner and Co. (Publishers), Ltd., London, Manchester, Bradford, New York, Montreal.) This is the twentieth edition of this invaluable publication. The efficient compilation of such a directory, difficult and arduous under normal conditions, is infinitely more so in war-time, but in spite of this the customary revision of details has been carried through in so far as has been possible. The revision of details covering enemy and enemy-occupied territories has, of course, not been possible, and these countries have been omitted from this edition. The present conditions of trading, particularly the accepted restriction placed on the export of cotton goods, and perhaps equally so the effect of the " concentration " of industry, has brought into prominence the vital need for keeping before the trade the various trade marks, and a Trade Marks Section has therefore been added to the Directory. The Hosiery and Knit Goods Manufacturers Section is also published again as a separate volume at a nominal price, a feature which is being increasingly appreciated. The thumb-holes for ease of reference are labelled: Contents; Index; Exporters; Merchants; Spinners, Manufacturers and Doublers; Directors (British); Dyers, Finishers; Fabrics; Silk and Rayon; Hosiery and Knit Goods; Hosiery Yarn Spinners, etc.; Textile Trade Marks; Mill Supplies. All headings, indices and explanatory notes are printed in English, French, German, Italian, Spanish and Portuguese. The Directory is absolutely indispensable to all those concerned in any way with the cotton industry. The price by post, inland and abroad, is £1; Canada and United States, $7 (post and duty free).

ADDENDA.

255. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The nineteenth number of Series A, Genetics will be published shortly, and will contain the following paper reprinted from the *Journal of Genetics*:

Colchicine Produced Polyploids in Gossypium. I. An Autotetraploid Asiatic Cotton and Certain of its Hybrids with Wild Diploid Species. S. G. Stephens. Meiotic studies of a colchicine-produced tetraploid, *Gossypium arboreum* var. *neglectum* ($4n = 52$), gave further support to the hypothesis that diploid *Gossypium* species are secondary polyploids. Female gametes of the tetraploid were 40-50 per cent. fertile. This figure is in agreement with the expected fertility of the male gametes as calculated from the proportion of 26 chromosome plates found at metaphase 2. Pollen fertility, however, was considerably lower than this owing to the failure of germination or slow pollen-tube growth of many apparently viable grains. The tetraploid is therefore partially male sterile. The tetraploid when used as female parent crossed readily with several wild diploid and New World ($n = 26$) species. Their compatibility relations are discussed. In estimating compatibility it was found that only the percentage viability of fertilized ovules was affected by the male parent; variation in percentage of ovules fertilized may well have been due to chance. Studies of metaphase 1 in the triploid hybrids, tetraploid × *G. armourianum*, tetraploid × *G. raimondii* and tetraploid × *G. sturtii*, showed that on the average less than one trivalent was formed per pollen mother cell. Homologies between Asiatic and wild diploid species are therefore very low. Furthermore, there was evidence that *sturtii* chromosomes are not closely homologous with either Asiatic or American diploid chromosomes. The uses of induced polyploidy in cotton-breeding programmes are discussed. Its value is shown to be greatly restricted by the secondary polyploidy existing in all species of *Gossypium*.

256. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The fifteenth number of Series B, Physiology, has recently been published, and contains the following papers reprinted from the *Annals of Botany*:

On Diurnal Variations in the Mineral Content of the Leaf of the Cotton Plant. E. Phillis and T. G. Mason. Samples of leaves were collected at 6-hour intervals over a period of 96 hours, and their dry weights, water, and mineral contents determined, results being expressed on the sample basis. There were well-marked diurnal changes in all these values. The results are in harmony with the view that the mineral elements enter the leaf in the wood and, with the exception of calcium, are exported from it in the phlœm. The interpretation of the results is complicated by losses of mineral elements caused by dew.

Studies on Foliar Hydration in the Cotton Plant. I. The Effects of Potassium Supply and Size of Plant. T. G. Mason and E. Phillis. The published data on the relation between potassium supply and leaf hydration are stated to be contradictory, some investigators having found a positive correlation and others a negative one. It was found that an increase in potassium supply to plants growing in pots filled with sand led to a reduction in hydration and an increase in size of plant (size and hydration being negatively correlated), while with plants growing in the open in soil an increase in potassium supply led to increases in both hydration and size (size and hydration being positively correlated). To explain this difference in the effect of increased potassium supply on hydration in pots and in the field it is suggested that in pots an increase in size caused a reduction in hydration owing to the inadequate water-supplying power of the pots, while in the field an increase in size imposed no such stringent limitations on the water supply to the roots. To test this suggestion plants were grown in pots filled with sand under short daylight to ease the water strain, and it was found that under these conditions increased potassium supply was associated with increased size and increased hydration, while with controls growing under normal daylight increased size was associated with decreased hydration.

II. Preliminary Observations using the Disc Culture Method. T. G. Mason and E. Phillis. Discs punched from leaves were floated on water and salt solutions in daylight. It was found that the discs floating on salt solutions may show very large increases in water content (about 170 per cent. in 13 days) and that discs floating on water may lose water (about 20 per cent. in 13 days). This water uptake by discs took place both on a full nutrient solution and on solutions of $CaCl_2$. An estimate of the electrolyte concentration in the sap was obtained from conductivity measurements, while an estimate of total solute concentrations was obtained from freezing-point determinations. It was found that water uptake might take place without any change, and even with a decline, in conductivity and in freezing-point depression. Salt content (conductivity × water), on the other hand, showed a very close relationship with water uptake. It is suggested that salt increases the hydration capacity of the leaf proteins in the same way that the hydration capacity of gelatine is increased by salts in its isoelectric region. It is also pointed out that salt might affect respiration and that this might in some way influence the hydration capacity of protoplasm.

Studies on the Partition of the Mineral Elements in the Cotton Plant. III. Mainly Concerning Nitrogen. E. Phillis and T. G. Mason. The problem of protein regulation in the leaf is considered. In the first experiment it is shown that discs punched from leaves and floated on a nutrient solution containing inorganic nitrogen can form protein as readily as intact leaves. It is concluded that the synthesis of protein is determined by factors in the leaf and is independent of any factor exerted by the rest of the plant. In four subsequent experiments covering a wide range of conditions it is shown that the protein-N level (protein-

N per 100 gm. dry weight) is largely determined by the crystalloid-N level (crystalloid-N per 100 gm. dry weight). As the level of crystalloid-N is increased there is a rise in the protein-N level which reaches a maximum. After this, a further rise in the crystalloid-N level causes a decline in the protein-N level. It is pointed out that this type of relation is characteristic of apolar adsorption. Examination of rather limited data on the relation between polysaccharides and total sugars, and between insoluble and soluble phosphorus, suggests that adsorption may also play an important part in determining the levels of polysaccharide and insoluble phosphorus respectively.

PERSONAL NOTES.

DR. J. C. WILLIS, F.R.S.—Readers of the EMPIRE COTTON GROWING REVIEW in its peace-time form will join with the Corporation in heartiest congratulations to Dr. J. C. Willis, who celebrated his seventy-fifth birthday on February 20 of this year. Dr. Willis was Editor of the REVIEW from its first publication in January, 1924, until his retirement in October, 1939, and during those sixteen years he achieved a high degree of success in conveying through the medium of the REVIEW information to the scientific reader on subjects necessarily technical, without, however, repelling the non-technical reader, since he also found much in its pages of interest and value. Marooned in Switzerland by the war, Dr. Willis is still working with his characteristic industry on botanical problems, and we learn with much interest that we may expect, when conditions are more propitious, a further contribution to his work on plant dispersal in the form of a study on geographical distribution.

SIR EDWIN BUTLER, C.M.G., C.I.E., F.R.S.—We record with deep regret the death on April 4 of Sir Edwin Butler, who for more than twenty years had rendered most highly valued service to the Corporation as adviser on the organization of research and in his own special field of plant pathology. As Dr. Butler, he was a member of the Corporation's Research Committee when it was first formed in 1922. When the Committee was reconstituted in 1937 he was again appointed, and continued to serve up to the time of his death. He was appointed by the Sudan Government in 1927 to be a member of the London Advisory Committee on Agricultural Research in the Sudan, under the chairmanship first of Sir James Currie and later of Sir Richard Jackson. He paid a visit to the Sudan, mainly to advise on the control of blackarm disease, in 1931. Dr. Butler's distinguished career as Imperial Mycologist in India and in charge of the Agricultural Research Institute at Pusa was followed on his return to England by his outstandingly successful organization of the Imperial Bureau of Mycology, of which he was the first Director, and still later by his tenure of the secretaryship of the Agricultural Research Council. This accumulated experience gave a weight to his views which was only equalled by his modesty in their expression.

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"Memorandum by the Mechanical Transport Sub-Committee." Mr. G. H. Baillie, Mr. R. H. Brackenbury, Col. C. N. French. 1925. Price **2s.**

"Report on the Cotton-Growing Industry of Nigeria, 1926." Col. C. N. French. 1926. Price **2s.**

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"Conference of Workers on Cotton Growing Problems, held July, 1934." Papers and Discussions. Price **2s. 6d.**

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"Cotton Pest Control Work in Southern and Central Africa and the Rhodesias." J. W. Munro. 1937. Price **2s. 6d.**

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EMPIRE COTTON GROWING REVIEW.

The regular quarterly publication of the Empire Cotton Growing Review has been suspended for the duration of the war. It has been decided, however, to continue the publication of two numbers annually, in June and December, consisting entirely of abstracts from scientific, commercial, and technical literature. The price of each issue is **1s. 3d.** post free, and copies are obtainable from the publishers: Messrs. P. S. KING AND STAPLES LTD., 14, Great Smith Street, London, S.W.1.

THE EMPIRE COTTON GROWING REVIEW

ABSTRACT NUMBER

VOL. XX. DECEMBER, 1943. No. 2

ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

257. INDIAN COTTON: STATISTICS. We have received from the Indian Central Cotton Committee copies of Statistical Leaflets Nos. 2, 3 and 4, 1941-42, giving information regarding the following: Stocks of Indian raw cotton held in India by the mills and the trade on August 31, 1942; receipts at mills in India of raw cotton classified by varieties; approximate distribution by staple length of Indian cotton received at mills; exports by sea of Indian raw cotton classified by varieties; distribution by staple length of Indian cotton exported by sea, 1941-42 season.

258. FUTURES TRADING AND FUTURES MARKETS IN COTTON, WITH SPECIAL REFERENCE TO INDIA. By H. L. Dholakia. (New Book Co., 188-90, Hornby Road, Bombay. 1942. Price Rs. 10.) The growth of Futures Markets in various commodities is an important development in modern business, and the Futures Market in cotton is the most important one in India. Though large numbers of people are daily engaged in this business, there has been no authoritative source of information regarding the actual working of the Market, nor has the economic significance of its transactions been fully realized by the public, although the Futures Market plays a very important rôle in the fixing of prices, the allocation and distribution of risk, and in the levelling up of seasonal and other fluctuations. The present volume is the first systematic attempt made in India to fill this gap, and a great amount of work has been involved in its preparation. Beginning with a brief history of the futures trading in cotton, the author proceeds to analyse the nature of a futures contract, bringing out its full implications. The organization of a Futures Market in cotton is discussed with particular reference to the East India Cotton Association. The main issues regarding the problem of regulation of these markets are explained and concrete suggestions made to indicate the lines of reform, together with useful comparisons with similar markets in other countries. Whilst it may not be claimed that the treatise deals with the question in a completely exhaustive manner, it will be recognized that every effort has been made by the author to marshal facts and figures available to him in an impartial spirit. There are several points on which differences of opinion exist in the trade itself on some of the subjects dealt with, but the author has endeavoured to present both sides in an able manner. The volume should supply a long-felt want in the cotton trade in India, and enable all, including the public at large, to follow intelligently the various questions discussed. Among the important subjects treated in detail are the following: Hedging, Speculation, Prices, Parity Differences, Badla (Straddle) Operations, Options, Regulation of Futures Trading and Markets, the Problem of Unity of Control. The volume is furnished with a useful index.

259. INDIAN CENTRAL COTTON COMMITTEE. At the meeting of the Committee held at the end of January last the main item of discussion was the limiting of the area

under short-staple cotton, and maintaining and, if possible increasing, the area under food crops. Last season the area under short-staple cotton in India was reduced by 4,000,000 acres, and the area in the *kharif* season under food grains was increased by 8,000,000 acres. This substantial result was achieved by the Government mainly as the result of propaganda—it being pointed out to the grower that short-staple cotton was now being produced in excess in India and that food grains were an urgent necessity for the country. Unfortunately, short-staple cotton has proved a more paying crop to the grower than food. In the Punjab, for example, the grower received Rs. 73 per acre for short-staple cotton against Rs. 40 per acre for millets. Recommendations made for submission to the Government of India were that, if necessary, the area under short-staple cotton should be restricted compulsorily; that the farmer should be given inducements to grow food crops by the guarantee of a fair minimum price in advance at sowing time, by the supply of seed at cheap rates, the reduction of revenue, etc., and the removal or adjustment of the existing maximum prices for food grains. It was also recommended that a Central Crop Planning Board be established by the Government of India to work in co-operation with the Central Food Advisory Council.

260. CULTIVATION OF SHORT-STAPLE COTTON DISCOURAGED. (*Cotton*, M/c, 17/4/43.) It is stated from Bombay that the Indian Central Cotton Committee has recommended to the Central Government that since there was no scope for profitable cultivation of short-staple cottons during the war period, they should pursue the policy of discouraging increased cultivation of short-staple varieties, and it appears unlikely, therefore, that there will be any increase in acreage under these cottons during the coming season.

261. SPINNING TEST REPORTS ON INDIAN COTTONS, 1941-43. By N. Ahmad. (*Tech. Circs.* Nos. 530-537. Ind. Cent. Cott. Comm.) The circulars contain the grader's report and spinning test results for 289F, Surat 1027ALF, Bailhongal Jayawant, Gaorani 6, P.A. Multan 289F, 43F/P.A. 289F, P.A. 289F/K25 cottons compared in each case with A. R. Kampala cottons, for the 1941-42 season, and the report of the Standards Committee and spinning test results for Sind Sudhar cotton for the 1942-43 season.

262. TECHNOLOGICAL REPORTS ON STANDARD INDIAN COTTONS, 1942. By N. Ahmad. (*Tech. Bull. Ser. A*, No. 56, 1942. Ind. Cent. Cott. Comm.) As in former years, the agricultural details, grader's report, fibre particulars, spinning tests and remarks are given for each of the twenty cottons tested. Seven cottons showed a definite improvement over last season, ten gave practically the same performance, while three cottons showed a falling-off. Improvement is most marked in Gadag I (Bombay), LSS (Punjab), Late Verum (Nagpur), Umri Bani and Gaorani 6 (Hyderabad), Cambodia and Karunganni (Madras), and is not confined to any one area but is fairly widespread over the country. Little change was shown by Jayawant, Wagad, P.A.4F, 289F/K25, Mollisoni, V.434 (Akola), Sind N.R., Hagari, Nandyal, and Koilpatti, but there was a definite falling-off in performance by Surat 1027 ALF, Jarila, and Sind Sudhar.

263. TECHNOLOGICAL REPORTS ON TRADE VARIETIES OF INDIAN COTTONS, 1942. By N. Ahmad. (*Tech. Bull. Ser. A*, No. 55, 1942. Ind. Cent. Cott. Comm.) The valuation reports of the Standards Committee and of the Special Appeal Committee and spinning test results for the 1941-42 season are given for 24 varieties of cotton supplied by the East India Cotton Association, the grader's report and spinning test results for seven cottons supplied by the Bombay Millowners' Association, four by the Ahmedabad Millowners' Association, and three by the Southern India Millowners' Association.

264. SCIENTIFIC REPORTS OF THE IMPERIAL AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI, 1940-41. (Manager of Pubns., Delhi, 1942. Price Rs. 1.8 or 2s. 3d.) A report of progress in the research work carried out during the season in the different branches of agricultural science.

265. BENGAL: WORK ON COTTON. By N. Deb. (*Ind. Frmg.*, February, 1943, p. 98.) The trial of long-staple cotton is continuing at six centres in the Province. Last season the Dacca Parbhani variety made progress in all centres, and gave an outturn

varying from 10-12 maunds of seed cotton per acre. Work on short-staple cotton, financed entirely by the Indian Central Cotton Committee, is being continued at Rangamati in the Chittagong Hills tracts.

266. BOMBAY: A NEW COTTON FOR BROACH. (*Ind. Frmg.*, iv., **1**, 1943, p. 37.) Efforts in the past to select high-yielding and better-quality strains of Broach *desi* cotton resulted in the isolation of three strains, of which Broach *desi* 8 was found the most successful, combining a high degree of wilt-resistance with excellent fibre qualities ($\frac{7}{8}$-inch staple capable of spinning 30's warp counts). Ginning outturn, however, was low (32 per cent. compared with 40 per cent. of the local Goghari mixture), and further breeding work was financed by the Indian Central Cotton Committee to overcome this drawback. Attempts to isolate a suitable strain from the local Broach cotton had to be abandoned owing to the lack of suitable material and hybridization had to be resorted to. BD.8 was crossed with several high-ginning Goghari strains and types superior to Goghari in fibre qualities, and Segregates 1-2 and 1-6 were found promising. Besides being highly resistant to wilt they have a ginning outturn of about 40 per cent. and fibre length of over 21 mm., and are capable of spinning 45's and 41's highest standard warp counts, respectively. Their yield is significantly higher by 27 to 37 per cent. than that of the quality strain BD.8, but 10 to 16 per cent. less than that of Broach local. On the basis of mill valuation, the Segregates realized Rs. 7 more per acre than BD.8 and Rs. 20 more than Broach local. The testing of the Segregates under optimum conditions of wilt-infection has confirmed their high degree of resistance. To obtain improvement in fibre length and feel, they have been crossed with 1027ALF, and the results are being awaited with interest.

267. MARKETING OF PURE JARILA COTTON. (*Cotton*, M/c, 28/8/43.) Describes a scheme sanctioned by the Government of Bombay for the organization of co-operative cotton sale societies for the marketing of pure Jarila cotton in the West Khandesh and Nasik Districts, and the "Agmarking" of pure Jarila cotton produced by members of the co-operative societies and other approved cultivators. The estimated cost of the scheme, over a two-year period, is Rs. 17,920. The Government of Bombay has declared its intention of prohibiting the cultivation of any variety of cotton other than Jarila in East Khandesh District.

268. STUDIES ON THE QUALITY OF JAYAWANT COTTON GROWN FROM SEEDS OBTAINED FROM DIFFERENT STAGES OF PROPAGATION. By H. R. Nayak. (*Ind. J. Agr. Sci.*, xii., **6**, 1942, p. 865.) Jayawant cotton grown on the Dharwar Farm from seeds obtained from six stages of propagation was examined for fibre and agronomic characters during the 1938-39 and 1939-40 seasons. There was no evidence of deterioration in fibre length, fibre maturity and maturity ratio, but there was a tendency for the cotton to become coarser, to give lower ginning percentage, lower lint index, and lesser number of hairs per seed during the later stages of propagation.

269. MADRAS: MUNGARI COTTON. (*Ind. Frmg.*, iii., **12**, 1942, p. 645.) On the black soils of Anantapur, Bellary and Kurnool districts of the Madras Province cottons commercially known as "Westerns" and "Northerns" are grown; they are medium-staple varieties, capable of spinning 24's to 32's. The type of cotton grown on the red and light black soils, on the other hand, is that known as Mungari, which is a coarse short-staple variety similar to Bengals, and only spinning 8's to 10's. The yield and ginning percentage of Mungari are, however, much higher than those of the Westerns and Northerns. The coexistence of these widely different strains in the same tract favours undesirable mixing and hampers the spread of improved strains like H1 and N14 evolved in the Westerns and Northerns cottons respectively. To overcome this difficulty the Indian Central Cotton Committee has sanctioned a scheme for the tract to evolve types of cotton suitable for red soils and combining the quality of the Westerns with the yield of Mungari, to replace the inferior Mungari. Experimental trials have shown that none of the strains of Asiatic and American species imported from Central Provinces, Bombay, Hyderabad and Coimbatore give better yields than the local type, and, further, that strains H1 and N14 are unsuitable for growing on red soils. A comparison of the results of trials during the past four seasons has

shown that Co.4 is more suited to light black soils, while V434 is more consistent in behaviour, especially on red soils. The more promising selections from Mungari and other varieties have been tested against the local, but have been found later maturing than the control. Accordingly, crosses have been made between the desirable selections and the early maturing varieties like V434, and the hybrids are now in the first and second generations.

The problem of the control of the small leaf disease is of great importance to the tract, and the Committee is financing its investigation at Poona by Dr. B. N. Uppal, Plant Pathologist to the Government of Bombay. The testing of *arboreum* and *herbaceum* cottons with the object of isolating a type resistant to the small leaf disease will constitute an important item in the future programme of work. It is intended also to start concurrently the breeding of early thrips-resistant strains of American cottons. Considerable damage is caused to the cotton crop in the early stages of growth in the tract by the red hairy caterpillar, and experimental plots have had to be discarded in the past on account of the havoc caused by this pest. Cucumbers were tried as a trap crop, and these were found to be preferred by the caterpillars to cotton; experiments are now in progress to determine the method of using this crop for controlling the pest.

270. PUNJAB: SUSCEPTIBILITY OF AMERICAN COTTONS TO JASSID. By M. A. Khan. (*Ind. Frmg.*, February, 1943, p. 101.) Jassid is one of the major pests attacking Punjab-American cottons, and in years of abundant rainfall in the summer causes considerable losses. The work of evolving varieties entirely immune to the pest, or which possess a high degree of toleration to it, is in progress in Lyallpur in the Cotton Research Botanist's section. The existing Punjab-American varieties are being crossed with types reputed to be jassid-resistant, such as Tanguis and Cambodia. The crosses with Tanguis have shown a high degree of resistance in the initial stages, but later this resistance has gradually been reduced. The crosses with Cambodia, however, have yielded very promising progenies which have not only maintained resistance throughout, but have also given new types which possess superior fibre. It is hoped that the problem of jassid resistance in the Punjab may be successfully solved by these Cambodia crosses.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

271. BRITISH COTTON GROWING ASSOCIATION. The thirty-eighth Annual Report to December 31, 1942, states that while war conditions have presented many and varied problems to Empire cotton-growing countries, such as the difficulties of obtaining supplies, the necessity of growing more food crops, and the problem of shipping, there is every evidence that the industry has been well established and the decline in the total quantity of cotton grown in the Empire was in the main due to adverse weather conditions. The work of the B.C.G.A. (Punjab), Ltd., was continued: 21,400 acres were under cotton and gave an average yield of 648 lb. seed cotton per acre. Twelve ginning factories were in operation, and the total turnover was 17,600 bales. As to the cotton crops of the Colonies, the Sudan total is less than last year, but a large crop of high quality is still produced which is a valuable contribution to the war effort. Uganda, Tanganyika, and Nigeria also produced less than last season, mainly due to unfavourable weather. These smaller crops are not surprising since at all times, and particularly in seasons of adverse weather conditions, the growing of food crops rightly receives the first consideration. An exception to the smaller crops was Nyasaland, where production was nearly four times larger than the previous season. The total world production for 1941-42 was returned at 26,200,642 bales. Whilst many countries, which before the war were large exporters of cotton, are carrying substantial stocks for which no export outlets can be arranged, it is gratifying to record that on the whole shipping space has been provided for Empire crops.

272. THE STORY OF THE IMPERIAL INSTITUTE. By Sir Harry Lindsay. (*Bull. Imp. Inst.*, xli., 1, 1943, p. 11.) In the special number of the *Bulletin* commemorating the Jubilee of the Imperial Institute (founded in May, 1893), the present Director

has written a very interesting account of the history of the Institute and of the valuable work that has been carried out there during these years.

273. BRITISH HONDURAS: COTTON CROP, 1943. (*Crown Col.*, June, 1943, p. 450.) The 1943 crop of the newly developed Sea Island cotton industry of British Honduras is to be purchased by the Ministry of Supply at a price of 24d. per lb. f.o.b.

274. ASIA. CEYLON: COTTON INDUSTRY, 1941. (*Admin. Rpt. of Act. Dir. Agr.*, 1941. Received 1943.) The year was a better one for cotton than 1940. The sales to the Wellawatta Spinning and Weaving Mills, under the Cotton Purchase Scheme, amounted to 4,299 cwts. seed cotton at a cost of Rs. 47,124, compared with 2,315 cwts. at a cost of Rs. 24,259 in 1940. By arrangement with the Company the rate of payment for seed cotton delivered in Colombo was raised from Rs. 12.00 to Rs. 12.50 per cwt. The seed supplied free to growers was, as usual, the established Cambodia variety.

In connection with varietal trials, some of the imported strains showed promise in their first season's growth at Tissa, particularly two hybrids between U.4/4 and Cambodia. Individual plant selections were made from each variety, and the work is being continued.

275. CYPRUS: COTTON INDUSTRY, 1940-41. A note from the Dept. of Agriculture, received in May, 1943, stated that owing to the extension in the area under food crops there was a decrease in the acreage planted to cotton, and, in addition, adverse climatic conditions caused a reduction in yield. There was an improvement in the quality of Cyprus cotton owing to the increase in cultivation of the American variety Coker 100.

276. SHORTAGE OF FERTILIZER. (*Ann Rpt. Dir. Agr.*, 1941.) In view of the shortage of imported fertilizers and in order to supplement the generally poor supplies of organic fertilizers, the Department of Agriculture took over large dumps of the accumulated refuse from Nicosia town, and after removal of tins, bottles, stones and other non-decomposable matter, it was converted into "town refuse compost," which was offered to farmers within a reasonable distance of the dumps at a cheap rate below the cost of production. The demand at first was very slow, but towards the end of the year it increased considerably, and nearly 2,000 tons were sold in the last two or three months.

277. AFRICA. EAST AFRICA: COTTON CROP PURCHASES. (*Crown Colonist*, May, 1943, p. 363.) The British Government has agreed to buy the East African cotton crop until the end of the war at a guaranteed price.

278. NIGERIA: COTTON INDUSTRY, 1941-42. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) The output of cotton was less than half that of the previous season, which was a record export crop for the Protectorate. This was mainly due to a decision on the part of the Government at home that cotton-growing should be restricted to an export of some 4,000 tons (22,400 bales). The price was accordingly reduced at the ginneries, and it was announced that buying stations would not be opened in outlying areas. Propaganda in favour of early sowing and careful cultivation was also discontinued. Later on in the season, the policy was changed, and the country was asked to increase its output. Such steps as were possible were taken to secure this increase, but the weather of the latter part of the season proved unfavourable. Moreover, on account of the increased cost and comparative shortage of imported cotton goods, there was a boom in the local spinning and weaving industries, and cotton consequently found a ready sale in the native markets at prices which rendered the export price offered insufficiently attractive.

In the Southern Province the weather was favourable and the crop produced was considerably larger than that of the previous season, and of good quality.

As regards experimental work, little more than routine maintenance of the best strains and their multiplication was attempted, together with some mass selection in the ordinary crop grown in the Northern Provinces. Further progress was made in the South in the selection of improved strains of Ishan cotton.

279. COTTON INDUSTRY, 1942-43. (*Half-yrly. Rpt to March* 31, 1943.) *Northern Provinces.* Weather conditions during the growing season were responsible for a low

yield in many areas. The crop contained an increased proportion of immature cotton, but on the other hand the comparative dryness of the growing season resulted in less damage than usual from insect pests, and there was a reduction in the proportion of Grade II. As in the previous season several markets in outlying districts remained closed with a view to conserving petrol and tyres and the necessity of releasing cotton for the local weaving trade on account of the shortage of imported piece-goods. The British Cotton Growing Association again acted as Agents for H.M. Government for the purchase of cotton at the ginneries. The price paid was 1·4d. per lb. for Grade I seed cotton, compared with 1·0d. per lb. in 1941-42. For the third season the Produce Inspection Division was responsible for the inspection and supervision of cotton markets in the main belt. Regulations were rigidly enforced. In all markets demonstrations were given on the correct methods of sewing and sealing of bags. The proportion of Grade II cotton was 5·7 per cent. of the total crop purchased as compared with 5·5 per cent. in the previous season. 5,969 tons of seed have been provisionally reserved for planting in 1943, against 5,390 tons actually distributed in 1942. The Ministry of Supply have asked for a planned output of 45,000 bales, and if conditions are favourable this figure should be reached, but the production of groundnuts is of first importance, and to avoid undue competition in the groundnut areas cotton production for export will be limited to Zaria Province, Southern Katsina, and Sokoto and Kontagora Divisions of Niger Province, and no markets will be opened outside these areas.

The distribution of the Department's special seed in the Awai district of Zaria Province is giving good results. It has a higher ginning outturn than ordinary Allen, and a consignment shipped from the 1941-42 crop received the following favourable report: "Staple definitely longer and smoother than the average NAI cotton. Spinning satisfactory."

Southern Provinces.—Owing to unsatisfactory rains at planting time the 1942-43 cotton crop was not as good as last year in some areas. Cotton markets were opened in February, the grading being taken over by the Produce Branch of the Department owing to the Cotton Examiners of the Ibadan N.A. being occupied with food production work in Oyo Province. In all 18 cotton markets functioned during the season. The crop is estimated at about 4,500 bales. Applications for cotton seed are already being made for the 1943-44 season from the new cotton areas of Ondo Province, and it appears likely that cotton will be grown on a much wider scale in those areas.

280. DAUDAWA COTTON SEED FARM. A report of the activities at Daudawa during the period April 1, 1942 to March 31, 1943, states that the grant by the Corporation towards the maintenance of Daudawa Farm was continued. It was not possible to keep within this allocation owing to additional wartime activities and other responsibilities, and funds were provided by Government to meet the extra expenditure. Owing to the ravages of termites the cost of maintenance and of repairs to existing semi-permanent buildings was very high. Extensions to roads and repairs to existing roads were carried out, and anti-erosion terraces were repaired. During the season 473 acres were planted to cotton, 150 at Daudawa Farm, and 313 on Unit and Mixed Farms, the total yield being 97,259 lb. seed cotton. The multiplication of cotton seed continues to be of major importance at Daudawa, but with the posting of a second Agricultural Officer to the station the production of bacon pigs, potato growing, mixed farming, and cattle fattening have been undertaken. In addition to this work the Daudawa Settlement Scheme has been extended, and at the moment farms are available for 50 settlers, the total acreage given up to them being 768 acres. Eight new holdings were established during the year.

281. AN EXPERIMENT IN LAND SETTLEMENT. By C. B. Taylor. (*Trop. Agr.*, April, 1943, p. 71.) An interesting account of the work in connection with cotton seed improvement, the land settlement scheme, and the introduction of cattle cultivation and animal husbandry, etc., carried out up to date at the Daudawa Seed Farm established by the Empire Cotton Growing Corporation in the Katsina Emirate, Nigeria, in 1924, and handed over to the Nigerian Government by the Corporation in 1941.

[*Cf.* Vol. VII., p. 279, and Vol. XIII., pp. 12, 297, of this Review.]

282. NYASALAND: COTTON INDUSTRY, 1941-42. (*Ann. Rpt. Emp. Cotton. Grwg. Corpn.*, 1941-42. Issued 1943.) The cotton crop was considerably more than double that of the preceding year, the greater part of the increase being produced in the Lower River area. Larger crops were, however, reported from all the principal cotton-growing districts. The chief problem in the Lower River district is the control of red bollworm, and in order to continue their work on this serious pest more effectively the two entomologists on the Corporation's staff have moved from the Domira Bay Station: Mr. Pearson is at Zomba, where the Agricultural Department have kindly supplied him with the special laboratory accommodation that his work requires, and Mr. Mitchell is at Limbe, which is nearer the Lower River. Both entomologists are devoting their whole time to those insect pest investigations which are of special importance in that area. In the Central area, which is potentially the largest cotton-producing part of the country, the African agricultural system is one of shifting cultivation and bush fallowing, and as there is adequate land, it is unlikely that there will be any change for many years. The Experiment Station at Domira Bay is meanwhile endeavouring to settle what is the best way in which African practice can be systematized by incorporating a combination of long-term crops and bush fallowing as a means of conserving soil fertility. Cotton-breeding work continues. The present variety, which is derived from U.4, gives good yields in all districts, but work is being directed towards the possibility of improving its quality somewhat without sacrifice of its excellent agricultural properties.

283. COTTON INDUSTRY, 1942-43. The latest report from the Dept. of Agriculture is to the effect that in the Northern Province (excluding North Nyasa) the crop is clean and promising, and a heavier yield than in 1942 is anticipated. In the Southern Province, Lower River Districts, a heavy attack of jassid has developed and locust hoppers have caused damage to a number of gardens. In the Southern Province, excluding Lower River Districts, early growth and development has been good but locust damage has occurred in many localities.

284. COTTON CROP PURCHASE. (*Crown Col.*, September, 1943, p. 666.) The utmost satisfaction is expressed at the announcement that the British Government will purchase the entire cotton crop this season and each season until the end of the war, and for one complete season thereafter. The price, averaging 1½d., is satisfactory to native growers and to ginners, who receive a quota of the crop for ginning. The *Nyasaland Times* commends this, saying that African-produced crops require not high but stabilized prices.

285. NORTHERN RHODESIA: COTTON INDUSTRY, 1941-42. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) Cotton growing was confined to one part of the Luangwa Valley: some outlying areas had to be dropped on account of an outbreak of sleeping sickness, and there was consequently a reduction in the number of cultivators. The season was, however, exceptionally favourable, the average yield obtained being about 600 lb. seed cotton per acre.

286. SOUTHERN RHODESIA: COTTON MILLS. (*E. Afr. and Rhod.*, 15/7/43, p. 783.) The first cotton mills to be erected in British East or Central Africa were opened at Gatooma, Southern Rhodesia, on July 3, by the Governor of the Colony, Sir Evelyn Baring. The mills, established by the Southern Rhodesian Government, are being operated by the Cotton Research and Industry Board under the chairmanship of Major G. S. Cameron, who recalled that for eighteen years the Empire Cotton Growing Corporation (of which he is local representative) had run a cotton-breeding establishment and had evolved a jassid-resisting strain which had made the cotton industry a practical proposition in Rhodesia. The Minister of Finance, Mr. Max Danziger, stated that the industry offered a good example of dovetailing Government and private enterprise. Farmers grew the cotton, while the Government graded and ginned it, paid the growers a guaranteed price, and then handed the processed material to private enterprise for manufacture into blankets, cloth, and other articles.

287. SOUTH AFRICA: COTTON INDUSTRY, 1941-43. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) In the 1941-42 season there was no effective rain during the

seven months mid-April to the end of November, and ploughing could not be started, therefore, until it was already late for planting cotton. As a result the acreage was smaller and the crops were also below average. There was some disappointment with the price realized, 8¼d. per lb., which was considered low in comparison with prices of other farm crops. The whole crop was absorbed in the Union itself, whereas previously most of it had been exported. The acreage planted in 1942-43 was again very small, owing chiefly to the low price received by growers for cotton as compared with cereals and leguminous crops. At the Barberton Experiment Station prospects for a satisfactory season's work are good despite heavy rains which caused damage to late plantings.

288. WORK OF THE EXPERIMENT STATIONS, 1941-42. (*Prog. Rpts. of Exp. Stats.*, 1941-42.) The cotton crop on the Barberton Station was good for so short a season, since conditions were very favourable for early growth. The yield of strain 5143 in the variety trial, 350 lb. per acre, represents the general standard of most of the crop, though some acres of poorer soil gave much lower yields. Good progress was made with work on hybridization, which is proving of great interest and most promising. The U.4 × Cambodia material has already given types showing a better combination of desirable characters than has been obtained from pure U.4 strains in the past, and there is every prospect of obtaining stable strains retaining these characters. The " quality " crosses represent an attempt to combine lint of high quality with good hairiness of plant in a type with the general field characters of U.4. That this is not impossible for physiological reasons is shown by the fact that single plants showing this combination have already been obtained. It is impossible to judge, at present, whether a pure strain with these characters is a genetic possibility. A point of great interest is that both Sea Island and Egyptian cottons carry a gene, or genes, capable of giving very great density of hairs on the whole plant. Detailed investigation of the degrees and types of hairiness that occur in cotton is urgently required in connection with this hybridization work. The relation between different types of hairiness and jassid resistance, part of the whole problem of resistance to jassid, is also of immediate importance. The preliminary examination of hairiness, started in the present season, will be continued in the coming season as far as opportunity permits. In Swaziland the work on soil fertility is being steadily developed and evidence is accumulating on the immediate needs of both cotton and maize on different types of soil. It will be some time, however, before the results of different methods of soil treatment, as distinct from manuring, become evident.

289. SWAZILAND: COTTON INDUSTRY, 1941-43. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) Planting rains were very late in the 1941-42 season, and this led to a substantial drop in the proposed acreage. The climatic conditions continued unfavourable throughout the season. Drought, violent storms, hail, and intense heat in succession damaged the crop severely, and three weeks of almost continuous rain in March, accompanied by cold weather, stopped growth, caused serious shedding, and led to disease. Yields were naturally very low, averaging only 118 lb. of seed cotton per acre, compared with 186 lb. in 1940-41. Nevertheless cotton made a good showing compared with native food crops, the yield of maize in particular being very poor. The total production of cotton is still extremely small, but there are signs that cultivators are beginning to appreciate its value as a rotation crop for grain.

In 1942-43 the acreage planted was much the same as in 1941-42. That it showed no increase in spite of early and satisfactory rains is attributed partly to the fact that cultivators were preoccupied with food crops after a season of scarcity, and partly to the fact that prices for groundnuts and cereals have advanced much more than those for cotton.

290. SUDAN: RECORD COTTON CROP IN THE GEZIRA. (*Crown Col.*, September, 1943. p. 666.) In spite of labour difficulties most of the record crop of the Gezira has been picked. There is no doubt, however, that if the labour supply had been easier a larger crop would have been gathered.

291. WORK OF THE PLANT-BREEDING STATIONS, 1941-42. (*Prog. Rpts. of Exp. Stats.*, 1941-42; *Emp. Cott. Grwg. Corpn.*) In connection with the work on breeding black-

arm resistant strains of cotton, the 9th backcrosses of N.T.2 and X1730 types were grown and seed produced for sowing propagation plots at Shambat next season. Seed of the 7th backcross of N.T.2 was produced in sufficient quantity to enable a 45-feddan increase area to be sown at the Seed Farm of the Sudan Plantations Syndicate in the coming season, in addition to a series of plots for testing. Sufficient seed of the 7th backcross of X1730 was produced for testing in the Gezira and sowing in a ten-feddan propagation plot. Small quantities of other types were produced for inclusion in 1942-43 tests. These included an N.T.2 backcross homozygous for both factors B_1 and B_2 and therefore highly resistant to blackarm. The 6th backcross stage has been reached with crosses involving factor B_2, which is expected to confer a still greater measure of blackarm resistance. The addition of a gene conferring reddish flowers and leaves has been continued with and has reached the 9th backcross stage.

Crosses between Sakel and Tanguis, made in order to transfer the hairy leaf of the Tanguis strain to a plant of Sakel lint quality with a view to promoting jassid-resistance, have been taken to the 3rd backcross stage and are being proceeded with. Work carried out at the Central Station on leaf curl resistance is progressing satisfactorily. Three promising strains of American cotton are being bulked for further testing, and several promising selections from S.P.20 and S.P.84 (both Uganda cottons) have been isolated and will be tested in the Equatorial Province. Some 335 types of dura have been collected, and the most promising of these are being tested in both irrigation and rainfall areas.

292. Sudan Cotton, 1942-43. (*Cotton*, M/c, 1/5/43.) The annual reports of the Sudan Plantations Syndicate, Ltd., and the Kassala Cotton Co., Ltd., state that the high quality of the cotton which the Companies produce is a valuable contribution to the war effort, and the yields during the season were satisfactory. The crops, apart from seed, have been disposed of and some progress has been made in the sale of seed, though considerable quantities are still unsold. It would appear that the current crops should be as satisfactory as those of the last two years, but the effect of continued inability to obtain fertilisers and other problems inseparable from war conditions must not be ignored in estimating future prospects. There is a considerable shortage of labour for picking.

293. Tap-Root Damage of Cotton, Ascribed to Termites, in the Sudan Gezira. By F. Crowther and H. W. B. Barlow. (*Emp. J. Exp. Agr.*, xi., **42**, April, 1943, p. 99.) The paper describes the nature and extent of damage to the tap-roots of the cotton crop of permanent and other experiments at the Research Farm of the Sudan Gezira Irrigation Scheme. From a 4-year survey of the roots when pulled out after harvest it is concluded that the damage is primarily caused by termites. About one-third of the plants comprising the crop at Gezira Research Farm were damaged, and this value varied only slightly from year to year. Damage was invariably greater on land which was cropped in the year before cotton than on that left fallow. Where weeds were allowed to grow unchecked on this fallow the damage to following cotton was greater than where the fallow was repeatedly hoed. These differences are readily explained in terms of the increased vegetable matter, furnished either by the frequent cropping or by weed-growth, which proved attractive to termites. The same explanation holds for the increased damage which occurred when organic or green manures were applied some time before sowing. By contrast, inorganic nitrogenous fertilizers, which gave at least as large yield increases as organic manures, were without effect on the degree of damage. It is concluded that the damage almost always takes place during the first two months after sowing. Termites are often active among the seed-coats after germination, and the damage to tap-roots may arise because the termites, initially attracted to the seed-coats, either move on deliberately to the living roots or damage them accidentally while seeking other seed-coats. Loss of yield by tap-root damage is likely to be not more than 10 per cent. on the injured plants, or on rotations at present practised, which invariably allow a full year's fallow before cotton, about 3 per cent. on the crop as a whole. With closer rotations increased interference by termites must be expected. In

general, the data demonstrate the prevalence and activity of termites under African conditions of agriculture.

294. TANGANYIKA TERRITORY: COTTON INDUSTRY, 1941-42. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) The Director of Agriculture reports that in the territory as a whole the cotton crop planted in 1941-42 was not one of the largest. The weather resulted in much waterlogging and favoured the spread of pests. In the Lake Province the normal acreage produced approximately 34,000 bales as compared with the five years' average of 36,400 bales. Similar conditions affected the other Provinces also, and there, in addition, economic factors such as competition with highly priced food crops for war production also tended to reduce the acreage. Moreover, the cotton crop suffered severely from bollworms and stainers. In the circumstances the production of 51,000 bales in the Territory was not unduly low compared with the five years' average of 61,721 bales during the period 1937-41. The growers were fortunate in escaping by a few months a very severe depression in prices; in fact, exceptionally high prices ruled throughout the season owing to the strong demand from Bombay.

295. UGANDA: COTTON INDUSTRY, 1942-43. (*Crown Col.*, June, July, 1943, pp. 442, 516.) It is officially stated that the smaller cotton crop estimated for 1943 (approximately 100,000 bales) is mainly due to the fact that, in the recent uncertain conditions of marketing, stimulation has been directed to improving grade, quality, and yield per acre rather than to increasing acreage. Cotton seed from Uganda is now being used as fuel, instead of coal, by several East African factories, as a fertilizer on tea, coffee, rubber, and sugar plantations, and, mixed with sesame cake, as cattle food by Kenya farmers.

296. WEST INDIES. WEST INDIAN DEVELOPMENT. COMPTROLLER'S PLAN FOR £6,000,000 ASSISTANCE. (*W. Ind. Comm. Circ.*, March, 1943, p. 49.) Sir Frank Stockdale's Report as Comptroller for Development and Welfare in the West Indies was published in February under the title of "Development and Welfare in the West Indies, 1940-42" (H.M. Stat. Off., 1s. 6d. net). The preliminary portion of the Report, containing a description of the several colonies and islands, their natural advantages and disadvantages, and a summary of their most urgent requirements, shows the magnitude of the task that has to be undertaken and the diversity of the problems. The remainder of the Report, which runs altogether to 93 pages, deals, under subjects—public health, agriculture, labour, education, social welfare and communications—with the work accomplished by the Comptroller and his staff of advisers, the schemes prepared, and proposals submitted for the consideration of Colonial Governments and the Secretary of State up to September 30, 1942. The Report concludes with a tabular analysis of all the schemes for assistance which have been proposed, and shows that at September 30 last the proposals made involved a total expenditure of £5,894,324, of which £1,202,725 had already been approved: £844,266 was under consideration by the Secretary of State for the Colonies, and £3,847,333 was under consideration in the West Indies. Generally speaking, the schemes recommended have as their basis planned development over a number of years. Owing to the war many building projects and schemes involving personnel will have to be deferred, but in several cases proposals have been made and even sanctioned so that action can be taken after the war or when the supply position improves.

297. THE WEST INDIAN SEA ISLAND COTTON ASSOCIATION (INCORPORATED). The Seventh Ordinary General Meeting of the Association was held in Trinidad on December 12, 1942. The report contains the minutes of the business session of the meeting, the report of the Board of Directors, and statistics relating to the Sea Island cotton industry.

Dr. Phillis proposed on behalf of the Montserrat growers that the Association should press for the increased price of cotton lint which the Ministry of Supply had indicated that they would consider in the event of a proved rise in particular costs of production. The Chairman, Mr. C. C. Skeete, pointed out that representations had been made by the Governments of the islands concerned through the Comptroller for

Development and Welfare in the West Indies to the appropriate authorities in England, and their decision was awaited. The meeting recommended that authentic data be made available should the occasion arise to make further representations for an increase in price. Dr. Phillis, also on behalf of Montserrat, asked the meeting to consider the advisability of synchronizing cotton planting seasons throughout the Leeward Islands as a measure towards the establishment of better pest control. The meeting considered it impossible to synchronize the planting dates for the following reasons. In St. Kitts cotton is grown as a catch crop between the reaping and re-planting of sugar-cane, and must be sown in March to May. These months are too dry for the proper establishment of the crop in Nevis and Antigua, and cotton must be planted there in the wet season, September-October, and picked in the dry season, February-May. In regard to the suggestion that cotton cultivations in Montserrat are annually re-infested by immigrant adults of pink bollworm and cotton leaf defoliators from Antigua, the opinion expressed by the Professor of Entomology at the Imperial College was that it seemed highly improbable that heavy infestations of pink bollworm could be due to immigration of moths from Antigua, and there was little point in considering this possibility while sources of re-infestation continued to exist within Montserrat. The possibility of reducing damage by adjusting planting dates was also considered as remote. The meeting was in agreement with the view expressed by the Cotton Adviser, Mr. J. B. Hutchinson, to the Director of Agriculture of the Leeward Islands in October, 1942—namely, that the Montserrat cotton planters should take all possible steps to minimize multiplication of the two pests in the island, and that it must be accepted that infestations will start, but that there is no reason why they should not be kept within reasonable limits if the control measures advocated by Mr. Squire were carried out efficiently. The meeting concluded that if evidence were produced to show that Antigua was the main source of annual re-infestation of Montserrat, the only course left open to Montserrat growers would be to change their planting date to synchronize with that in Antigua.

The Chairman reported that the Agricultural Department of British Honduras was considering the question of developing a Sea Island cotton industry, and on the advice of the Cotton Adviser had made application for an annual supply of pedigree cotton seed from Montserrat. Mr. Hutchinson said that he saw no reason to discourage British Honduras from growing Sea Island cotton, but it was desirable that only pedigree West Indian seed should be planted. The meeting agreed to ask the Government of Montserrat to supply seed to British Honduras.

The difficulty of obtaining adequate supplies of insecticides was also discussed, and the meeting decided that the Association should submit a statement to the Comptroller for Development and Welfare in the West Indies, pointing out the disastrous effects which may result to the West Indian Sea Island cotton industry if adequate quantities of insecticides are not available at the right time, and requesting that steps be taken as far as possible to ensure timely deliveries of the industry's requirements in this respect.

298. The West India Committee: Report of the Executive Committee for 1942-43. (*W. Ind. Comm. Circ.*, June, 1943, p. 107.) The activities of the Advisory Committee in England of the West Indian Sea Island Cotton Association, on which the West India Committee is represented, have again been curtailed by the continuance of war conditions. The total production of Sea Island cotton in the British West Indies during 1941-42 season, amounting to 6,498 bales, was 1,915 bales less than the production in the previous season, with an overall yield of 123 lb. lint per acre compared with 156 lb. in the previous year. The entire crop of clean lint was purchased by the Ministry of Supply. The production of Marie Galante cotton amounted to 952 bales of 400 lb. each.

299. The Imperial College of Tropical Agriculture, Trinidad. In his Report for 1941-42 the Principal writes that " the most notable fact about the College during 1942 is that it has been allowed, and indeed required, to carry on its normal activities almost as though the world were at peace." Thanks to this far-sighted policy on the part of those in authority progress is recorded which is regarded as satisfactory for

any year, and remarkable for war-time. Research was continued on the important crops, cacao, sugar-cane, and bananas, and summaries are included of the investigations carried out by the Departments of Agriculture, Botany, Chemistry and Soil Science, Economics, Entomology, Mycology, and Sugar Technology. A new line of research on Ensilage has been undertaken, and offers a completely new field for investigational work of immediate practical importance. The number of students in residence was thirty-nine. The Associateship was awarded to nine candidates who completed the course in 1941. Forty-one scientific papers were published during the year, including those written for *Tropical Agriculture*. The following additions were made to the Library: parts of periodicals, 6,566; pamphlets, 1,134; books purchased, 87; books presented, 3.

300. BARBADOS: COTTON EXPORT LEVY. (*W. Ind. Comm. Circ.*, June, 1943, p. 115.) An order has been issued imposing a levy of one halfpenny per pound on all cotton exported from the Colony during 1943.

301. THE COTTONS OF JAMAICA. By J. B. Hutchinson. (*Trop. Agr.*, March, 1943, p. 56.) A summary of information on the cottons of Jamaica gained during a visit to the Colony in May and June, 1942. The indigenous cotton of the island is *Gossypium hirsutum* var. *Marie-galante*, which is highly variable and exists in a wild state as well as in association with man in house yards and on vacant lots and roadsides. Ecologically, it is the cotton of the xerophytic scrub lands, and is commonest and most variable in the dry southern plains. *G. hirsutum*, the Upland cotton, is only known from Jamaica from specimens recorded by Watt in "The Wild and Cultivated Cotton Plants of the World," 1907. A single plot of *G. hirsutum* var. *punctatum* was found near Black River, but it is known to have been grown from imported seed. Perennial and annual (Sea Island) forms of *G. barbadense* and *G. barbadense* var. *braziliense* have been introduced from time to time in attempts to establish commercial cultivations. The perennial forms have become established in the moister and more mesophytic areas, such as St. Mary and Portland. Mr. Hutchinson expressed the opinion that if pest hazards could be reduced, Marie Galante cottons would offer attractive prospects for the establishment of commercial cotton growing. They are well adapted by their drought resistance and perennial habit to withstand the uncertain and erratic rainfall conditions in southern Jamaica, and there is in that area a considerable peasantry in need of a cash crop, and ample land on which it could be grown.

302. ST. KITTS, NEVIS, AND ANGUILLA: COTTON INDUSTRY, 1942. (*Ann. Rpt. Agr. Dept.*, 1942.) In St. Kitts the cotton crop of 1942 was very poor owing to exceptionally heavy rains and attacks of *Alabama argillacea* and pink bollworm. A good cotton crop was reaped in Nevis in 1941-42; *Alabama argillacea* caused injury to the cotton, but neither in this island nor in Anguilla was there serious damage from pink bollworm. In Anguilla also the cotton yield was better than in the previous season. Marketing of the peasants' cotton in Nevis was continued as in the past. An advance of 4d. per lb. was paid on all clean seed cotton delivered to the Department, and an additional advance of 1d. per lb. was paid later to assist growers in the preparation of land for the next crop. 1,369,482 lb. of clean seed cotton were purchased and 410,519 lb. lint sold to the Ministry of Supply. A price of 1s. 10½d. per lb. was received for the greater part of the crop. After deducting expenses a bonus of 1½d. per lb. for seed cotton was paid, making a total price of 6½d. per lb. for clean seed cotton. Government also advanced ½d. per lb. on stained seed cotton.

303. ST. VINCENT: COTTONSEED OIL. (*Crown Colonist*, May, 1943, p. 371.) Production of refined cottonseed oil in St. Vincent has been stimulated by the war, to the detriment of the import trade in edible oils and fats. Good grade edible oil from the Government cotton ginnery is used extensively for cooking, and from the refinery residues cheap soap is made. Experiments begun in 1938 to determine the effect of manuring on oil formation have yielded valuable data.

COTTON IN THE UNITED STATES.

304. AGRICULTURAL STATISTICS, 1942. (U.S. Dept. Agr. Obtainable Supt. Documents, Washington, D.C., price 75 cents.) This is the seventh issue of this publication, prepared under the direction of the Yearbook Statistical Committee. It includes statistics of grains, cotton, sugar, tobacco, oilseeds, fats, fruits, vegetables, hay, seeds, and minor field crops; beef cattle, hogs, sheep, horses, mules; dairy and poultry statistics; statistics of foreign trade in agricultural products, farm capital and income statistics; agricultural adjustment and conservation statistics; miscellaneous agricultural statistics. A table of weights, measures, and conversion factors used in the Department is included, and the volume is furnished with a useful index.

305. THE AMERICAN COTTON CROP SEASON, 1942-43. GRADE AND STAPLE REPORT. (*Cotton*, M/c, 5/6/43.) According to a report issued by the Bureau of the Census, Upland cotton ginned in the United States during 1942 was higher in grade than that of 1941, but the staple length averaged about the same. This season 9·5 per cent. was rough ginned compared with 7·2 last season. The grade index of this season's ginnings was 95·0 compared with 94·1 last season. The percentage of Strict Middling White and better was about the same for the two seasons. Middling White included 33 per cent. of ginnings this season and the corresponding figure last season was 31 per cent. Low Middling White and below accounted for less than 13·5 per cent. of this year's crop as compared with 15·2 per cent. last year. The average staple length of ginnings this season was $\frac{1}{32}^{0}$ inch, practically the same as last season, and there was little change in the proportions of the various lengths. This season, 18 per cent. was $\frac{29}{32}$ inch and shorter, 37 per cent. $\frac{15}{16}$ through 1 inch, 39 per cent. $1\frac{1}{32}$ through $1\frac{3}{32}$ inches, and 6 per cent. $1\frac{1}{8}$ inches and longer. The grade of the American-Egyptian cotton this season was higher, but the average staple length was shorter than that of last season. The production of American-Egyptian cotton was increased from 57,929 bales last season to 73,189 this season. Sea Island cotton was lower in grade and longer in staple this season, but ginnings were only one-fourth of those of last season.

306. COTTON COVERS FOR BALING THE 1943 AMERICAN COTTON CROP. (*Cotton*, M/c, 22/5/43.) Manufacturers of bale wrappers made of cotton will receive an indemnity payment of 40 cents instead of 35 cents on each wrapper manufactured and sold after April 1, 1943. This announcement is made by the U.S. Dept. of Agriculture to ensure the manufacture of sufficient wrappers for the 1943 cotton crop. Some 8,000,000 wrappers are required this year, but total production is expected to be nearer 4,000,000. Baling of cotton in cotton wrappers is one of the Dept. of Agriculture's projects designed to promote new uses and new markets for American low-grade cotton.

307. AMERICAN COTTON STOCKS, 1942-43. By A. B. Cox. (*Text. Wkly.*, 1943, **31**, p. 656. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 292.) A cotton balance sheet for the seasons 1933-34 to 1942-43 is presented and the supply situation is discussed. It is pointed out that there will probably be a carry-over of about 9,700,000 bales in the United States on July 31, 1943. As the new crop will not be available for use in quantity for nearly two months after August 1, there is need, at the rate of present consumption in the United States and export, for a carry-over of 5 to 6 million bales of cotton of the qualities being consumed and exported. The available supply is analysed according to staple length and grade; there seems to be an ample supply of all qualities except $\frac{15}{16}$ inch and $\frac{31}{32}$ inch, and a possible surplus of cotton $\frac{7}{8}$ inch and under, and possibly some of the staples $1\frac{1}{8}$ inches and over. The surplus grades are apparently low middling and below, and strict middling and above. The excess supply of cotton in the United States on July 31 will not exceed 4,000,000 bales, the bulk of which is low-grade short-staple cotton in the hands of the Government. After the last war there was a tremendous demand for low-grade cotton in Europe, and a similar accumulation of low-grade American cotton was readily disposed of. It is suggested that more concern should be shown over present shortages in important qualities of lint cotton and cottonseed products than over the surplus of low-grade cotton.

308. Cotton Standardization and Related Services: Development. U.S. Dept. of Agriculture. (*U.S. Dpt. Agr. Marketing Admin. Serv. and Reg. Announcements*, **168**, 1942. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 305.) A report of developments in cotton standardization and related services which includes reports of International Universal Cotton Standards Conferences, standards for American, Sea Island and American-Egyptian cottons, standards for length of staple, preparation of standards for long-staple cotton, symbols for grade designations for American upland cotton, reasons for variations in the classification of cotton, public cotton classing services, changes in contracts for future delivery, classing and market news services for organized cotton-improvement groups, and cotton-fibre testing services.

309. Climate and Man. (*Yrbk. of Agr.*, 1941, U.S. Dept. Agr., Washington, D.C. Price $1.75.) The invaluable series of yearbooks of agriculture produced by the U.S. Dept. of Agriculture was continued in 1941 by the publication of the sixth of the series under the title of "Climate and Man," and the Yearbook Committee are to be congratulated on maintaining the high standard set by its predecessors. The volume takes the usual form of a symposium of expert articles which will be found most useful by the layman, and a lengthy summary is also included by Gove Hambidge.

The book is divided into five parts under the following headings: Climate as a World Influence; Climate and Agricultural Settlement; Climate and the Farmer; The Scientific Approach to Weather and Climate; Climatic Data—including a wealth of facts about climate and weather in the United States, with special reference to agriculture. A comprehensive index is included, and the volume is well furnished with numerous photographs, diagrams, and maps.

310. American Cotton Industry: War-Time Economy and Research. Cotton Textile Institute, Inc. (*Cotton*, U.S., **106**, 11, 1942, p. 75. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 168.) A report is given of a convention at which the man-power problem in the American textile industry, difficulties of supply and machinery replacement, anti-inflation control, the part of the cotton textile industry in the war effort, and research, were discussed. The need for more intensive and extensive research on cotton and its products, and for a central research agency, was emphasized. It was suggested that the following three kinds of research should be carried on simultaneously in the industry: (1) Fundamental research aimed at developing basic information about cotton and the machines on which it is processed; (2) Applied research of a general nature, developing the fundamental data into a form capable of translation into commercial use to render the competitive position of cotton generally more favourable; (3) Product research by each and every mill for the betterment of its own products: a keen healthy competition within the industry should be in existence. The need for technologists trained in the research approach to problems was pointed out. The formation for the cotton textile industry of an institute similar to the Institute of Paper Chemistry was urged. The latter is a co-operative research institution which functions as follows: on a specific research problem, the member pays for the job and receives exclusively the results; fundamental and generally applicable research is carried on by graduate students and the results are made available to all members. This institute at the same time is training men, with a research approach, for the members of the industry.

311. American Research Institutions: Organization. (1) L. T. Work. (2) H. B. Hass. (3) D. H. Sheehan and F. J. Curtis. (*Ind. Eng. Chem.*, 1943, **35**, 221 *et seq.* From *J. Text. Inst.*, May, 1943, A284.) (1) A discussion of the definition of research, the growth of technical departments in industrial organizations, research and development sections, the location of research laboratories, and budgeting for research. (2) An account of the policies and practices of the Purdue Research Foundation which was established in 1930 for the purpose of promoting closer relations between industry and the university. (3) Deals with accounting for research, which usually comprises the projection or budgeting of research expenses and the determination of the actual cost.

312. Climate and Cotton. By C. B. Boyle. (*Yrbk. of Agr.*, 1941, U.S. Dept. Agr., Washington, D.C., p. 348.) Cotton is being planted and picked somewhere in

the world every day in the year. So useful is the fibre that many efforts have been made to extend production beyond the naturally favourable climatic regions, and in modern times some of these efforts have been successful through the breeding of rapid-fruiting, early-maturing varieties. It is now generally agreed, the author writes, that the climatic requirements for successful commercial production are a mean annual temperature of not less than 60° F. or, under certain otherwise favourable conditions, of not less than 50°; a frost-free season of 180-200 days; annual rainfall of not less than 20 and not more than 75 inches, with suitable seasonal distribution; open, sunny weather at least half the time throughout the year. Weather conditions have an enormous influence on yield and quality. Cotton thrives best when there is a mild spring with light, frequent showers; a moderately moist summer, warm both day and night; sunny weather during the period of bloom; a dry, cool, prolonged autumn. On the other hand, there is a long list of unfavourable conditions. Cold wet weather in spring may rot the seed, retard seedling growth, favour cutworms and seedling diseases. Rains that cause the soil to pack or crust at planting time may ruin the stand, and too little moisture may prevent germination. Cold winds, sand-storms, and dust-storms early in the season may kill seedlings. Cold nights and hot days while the plants are young favour the cotton louse. Heavy rains and low temperatures in May and June favour diseases and insects. A wet summer induces too much vegetative growth and favours the boll weevil. Severe summer drought often stunts the plants and causes too early maturity. Rainy weather at picking time retards maturity, interrupts picking, damages the exposed fibre. Hailstorms during the growing or harvesting season may do much damage.

The author points out that the peculiar fruiting habit of the cotton plant makes it sensitive to weather conditions over an exceptionally long period. Flowers appear progressively every 2½ days on the fruiting branches that develop up the main stalk, and every 6 or 7 days outward along the fruiting branches. Throughout the entire period of progressive fruit formation, weather influences the quantity of fruit formed, the amount of shedding, the size of bolls, and the quality of the fibre. Among the causes of shedding are insects and diseases, high temperatures that result in excessive loss of moisture through transpiration and evaporation, heavy and continuous rain, abrupt changes in weather, imperfect pollination due to rain, and root injury. The principal cause is probably lack of sufficient soil moisture. Boll weevils increase rapidly as the season advances, and practically all the buds developed later than July are apt to be destroyed. This major handicap of cotton production has been met by breeding rapid-fruiting, early-maturing varieties and working out cultural practices that favour earliness. Federal and State co-operative studies carried out in great detail have proved that both inherited characteristics and weather govern the yield and fibre qualities of cotton. It has not been possible, however, to work out an accurate method of local crop forecasting based on local weather conditions. The author believes this is partly because the right kind of weather data are not available—there is little or no information, for example, on such extremely important factors as soil moisture and transpiration—and partly because the long fruiting period of the cotton plant makes drastic changes in yields possible up to the last minute. For the Cotton Belt as a whole, however, seasonal reports and crop forecasts have been remarkably accurate.

Cotton is bought on the basis of grade standards, and the author points out that exposure to the weather through careless harvesting and storing is responsible for enormous losses to growers, much of it preventable. Cotton that is dull, grey, or blue as a result of delayed picking and exposure in the field sells for about $15 less per 500-lb. bale than high-grade white ⅞-inch staple. Seed too is greatly damaged by careless harvesting and storing. A 500-lb. bale of cotton left uncovered flat on the ground had only 130 lb. undamaged at the end of 8 months as compared with 499 lb. undamaged in a bale stored in a warehouse.

At the end of the paper the author discusses the areas of production of all the commercial types of cotton throughout the world, yields in the principal regions, and the soils and climate of the Cotton Belt of the United States.

313. TEXTILE MILL LABORATORY. By R. W. Philip. (*Cotton*, U.S., 1943, **107**, 2, p. 79. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 306.) An account is given of the reconstruction, equipment and work of the laboratory at Tallassee Mills, Alabama. The mills manufacture ducks, drills and twills, and industrial fabrics for the rubber, bakelite and other industries. The laboratory division consists of the main physical testing laboratory room, the chemical laboratory, the office, and the display room. An air-conditioning system is provided and the physical testing laboratory is maintained at 70° F. and 65 per cent. R.H. A list of machines and instruments in use is given. The laboratory personnel consists only of employees with practical mill experience, who at any time can conduct tests in the mills, and have done so before learning laboratory work. The laboratory is under the supervision of the assistant superintendent of the mill, who virtually has the position of technical superintendent. Tests are made on the finished products, and regular tests are made for weight, counts, ends and picks, twist, crimp, gauge, strength, elongation and other physical characteristics. In addition the laboratory staff carries out (1) control testing—*e.g.*, testing of laps, sliver and roving by daily weighings, (2) check testing, including weekly regain tests, and end-breakage, loom stoppage, desizing, viscosity and other tests, and (3) practical research testing, such as tests of blends of cotton to determine spinning qualities, tests of drafts, settings and speeds, and tests of new products, materials and ingredients. On the results of the control tests, the laboratory has the authority over any department to order necessary changes. The results of check tests and practical research tests are reported to the main office and to the departments involved.

314. BREEDING CALIFORNIA COTTON. By G. J. Harrison. (*Calif. Cultiv.*, **88**, 1941, p. 696. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 241.) A fibre laboratory for research purposes, with controlled temperature and humidity, has been in operation since May, 1941. By means of X-ray tests some cotton varieties having fibre of exceptional strength have been discovered, though at present their yield is below average. Tests of resistance to *Verticillium* wilt have been made both in the laboratory and the field; the two tests have given comparable results. Wilt resistance has been shown to be generally associated with late maturity, small bolls and short staple, but certain American-Egyptian varieties have also shown resistance. Direct selection, hybridization and backcrossing are all being used with success in the wilt resistance breeding, and pure genetical research is being carried on at the same time.

315. GEORGIA: COTTON VARIETY EXPERIMENTS, 1938-42. By R. P. Bledsoe and E. D. Matthews. (*Ga. Sta. Circ.*, **140**, 1943. From *Exp. Sta. Rec.*, **89**, 1, July, 1943, p. 59.) Coker 100, Stoneville 2B, and D_1 and P.L. were high in money value and lint yield per acre in north Georgia tests, 1938-42. Results were similar in 1940 and 1942 except that the yield of Coker 200 also was high. Three strains of Empire, a new variety developed by the station and U.S. Dept. of Agriculture, co-operating, were noteworthy in 1942 tests. Empire is of the Stoneville type but has larger bolls, higher lint percentage, and is early. Its lint length approximates that of the three varietal leaders above. In south Georgia tests, 1938-42, leaders in acre value included Coker 4-in-1, Coker Cleve-wilt 7, and W. W. Wannamaker Cleveland Wilt Resistant. Average results in 1942 resembled those of previous tests, except that Coker Cleve-wilt 7 yielded relatively lower than heretofore. The most promising new strains tested in 1942 were Wannamaker Stonewilt 18 and Bobshaw 1.

316. THE GROWING OF SEA ISLAND COTTON IN THE COASTAL PLAIN OF GEORGIA. By J. G. Jenkins. (*Ga. Coastal Pl. Sta. Bull.* 33, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 188.) Cultural and field practices and harvesting, ginning, and boll weevil control methods involved in growing Sea Island cotton are described, with comments on marketing the crop. Emphasis is placed on planting pure seed, its maintenance and distribution, roguing seed fields, and advantages of one-variety communities in maintaining purity. Dosages for seed treatment are recommended, and a home-made treater is illustrated.

317. MISSISSIPPI: CHEMICAL AND PHYSICAL PROPERTIES OF SOME OF THE IMPORTANT ALLUVIAL SOILS OF THE MISSISSIPPI DRAINAGE BASIN. By R. S. Holmes and W. E.

Hearn. (*U.S. Dept. Agr. Tech. Bull.* 833, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 162.) Descriptions are given of the soil profiles and of other samples, including location, drainage, texture, consistency, and colour. Laboratory determinations include mechanical and chemical analyses of the soils, *p*H values, chemical analyses of the colloids, mineralogical determinations on certain colloidal material, and determinations of certain minor elements on a few of the soils. The chemical composition of the non-clay material is estimated.

318. The Delta and Pine Land Company of Mississippi, once Plagued by Floods and Boll Weevils, is now the World's Largest Cotton Seed Dealer. By H. Severson. (*Sth. Seedsman*, **5**, 1942, No. 11. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 242.) This season the Delta and Pine Land Company of Scott, Miss., planted its land with a new strain of cotton, Deltapine 14 (44-15). The report of the U.S.D.A. Agricultural Marketing Administration on the spinning quality is as follows: "Deltapine 14 (44-15). Very low percentage of manufacturing waste and strong yarns of good appearance combine to make this an outstanding variety in the test."

319. New Mexico: Labour Needs for Seasonal Operations on Farms. By P. W. Cockerill. (*Bull.* 299, *Agr. Exp. Sta., New Mexico*, 1943.) The scarcity of farm and ranch labour in New Mexico in 1942, while serious, did not result in reduced production of farm and ranch products to any appreciable extent. Where labour shortages occurred producers accomplished the work by working longer hours, employing more family labour, exchanging labour with neighbours, and prolonging certain farm operations beyond the normal period. Such delay, however, in some instances, caused decreased yields and, in case of delayed harvest, a slight lowering of quality of the product. The outlook for 1943 appears much more serious. The prospects are for less available labour and deficiencies in farm machinery and transportation, and it may not be possible to meet the production goals assigned to the State for this year. This is especially true of long-staple cotton, vegetables, peanuts, and dairy produce. Even with normal moisture conditions, production of some farm commodities may be reduced by 10 per cent. as compared with 1942, without a corresponding increase in substitute products.

320. Texas: Gearing Texas Cotton to War Needs. By C. A. Bonnen *et al.* (*Bull.* 624, Texas Agr. Exp. Sta., 1942.) To meet adequately Texas war needs for cottons with good spinning performance, the production of varieties of high spinning quality and staple lengths of $\frac{15}{16}$ inch and longer should be increased. Recent variety tests at Lubbock and other stations show that certain varieties produce lint of $\frac{15}{16}$ inch and longer, and yield, with few exceptions, as much as or more than cottons of $\frac{7}{8}$-inch and shorter staple. Texas has resources peculiarly adapted to the production of cotton at a minimum labour cost. Assuming the most common size and type of farm equipment, labour requirements range as low as 20 hours per acre. A mechanical harvester has been developed which is capable of picking 95 to 98 per cent. of the cotton in the plains area, reduces harvesting labour about 75 per cent., and lowers the quality of the cotton about half a grade.

321. Division of Feed Control Service Permits Additional Grade of Cottonseed Meal. By F. D. Fuller and G. S. Fraps. (*Circ. No.* 97, Texas Agr. Exp. Sta., 1942.) "The Texas cottonseed crushers requested the adoption of a definition of 41 per cent. protein cottonseed meal, which would contain not more than 12 per cent. crude fibre, and gave reasons for their request. The average protein content of Texas cottonseed meal decreased from 47·65 per cent. protein in 1907 to 43·71 in 1915, after which it decreased slightly to 43·26 in 1931-32, and then gradually to 42·79 in 1940-41. The fat decreased from 9·73 in 1907 to 7·38 in 1915, then remained almost constant with fluctuations to 7·51 in 1932-33 and decreased to 6·59 in 1940-41; that is to say, the process of manufacture was improved by increasing the quantity of oil extracted. The crude fibre increased from an average of 6·50 per cent. in 1907 to 10·62 in 1915, after which there were variations in crude fibre but no regular change. In 1940-41 the average crude fibre was 10·28 per cent. When the protein is calculated to a basis free from water, fat, and hulls, there was a sudden but permanent decrease in protein in 1924-25 and a second decrease in 1940-41. Some cottonseed crushers have

had difficulty in manufacturing cottonseed meal containing 43 per cent. protein. Manufacture of a cottonseed product containing 41 per cent. protein if the crude fibre is not permitted to exceed 12 per cent., which is the quantity now permitted in 43 per cent. protein cottonseed meal, would not lower the quality of the product by the introduction of cottonseed hulls. Since cottonseed meal is defined as a product of cottonseed only, composed principally of the kernel, with such portions of the hull as are necessary in the production of oil, if the product does not contain an excess of hulls it may properly be called cottonseed meal. A definition of 41 per cent. protein cottonseed meal was adopted. It must contain not less than 41 per cent. protein and not more than 12 per cent. crude fibre."

322. VIRGINIA: SEVEN-YEAR EXPERIMENT IN COTTON BREEDING AT HAMPTON INSTITUTE. By T. W. Turner. (*Proc. Va. Acad. Sci.*, 1940-41, **2**, 1941, p. 181. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 242.) The aim of the Institute has been to breed a strain of cotton which has 5-lock bolls. Of 55 varieties grown at the beginning none had 5-lock bolls only. Oklahoma Triumph produced rather large bolls with 3 to 5 locks per boll. The 5-lock bolls were less than 5 per cent. of the total for the plot. Trice had the same number of locks, but smaller and maturing earlier. In 1934 there were 33 plants bearing 5-lock bolls only, the numbers rising to 312 in 1940; the percentage of 5-lock bolls for the plot was 92, rising to 96 in 1940. Bolls with 5 locks may produce 10 to 11 per cent. more lint than those of 4 locks.

COTTON IN EGYPT.

323. EGYPT: COTTON CROP, 1942-43. (*Cotton*, M/c, 12/6/43.) The yield is estimated at 4,153,000 kantars, compared with 8,204,000 kantars for the 1941-42 season. Government regulations prohibiting the planting of any cotton in some districts, and specifying that only certain varieties should be planted in other districts, decreased the area planted in 1942-43 to 702,627 feddans, against 1,643,629 feddans in 1941-42, but the decrease in production has been relatively smaller. Over the crop as a whole the average yield this season has been 5·91 kantars per feddan, compared with 4·99 kantars per feddan last season, thus providing another instance of the tendency towards higher yields per acre when acreage is reduced.

324. COTTON CROP, 1943-44. (*Cotton*, M/c, 28/8/43.) The Anglo-Egyptian Chamber of Commerce in *Bulletin No.* 19 gives the following information concerning the 1943-44 cotton crop: During May the weather was rather cool but had no bad effects on the growth of the cotton plant. Compared with normal growth, however, the crop is still a fortnight to a month late according to districts. The condition of the crop is fairly satisfactory in some districts, but in areas where resowing has been necessary on a large scale the plants look rather weak. No damage from pests is reported except for a few slight attacks from thrips. Up to the time of writing water for irrigating the crop was adequate.

325. EGYPTIAN LONG-STAPLED COTTON. (*Cotton*, M/c, 3/4/43.) With regard to the new long-stapled Egyptian cotton, described as Giza 39, that is being developed in Egypt, it is stated that the Cotton Research Board carried out extensive tests on the cotton last year, and is satisfied that a big advance has been made. It was already known that this new type gave a yarn strength superior to that of Malaki, the present best variety in the Egyptian range, and the agricultural merits of high yield per acre and clean, high-grade cotton appear also to be proved. In addition, this cotton has a lighter colour than Karnak and Malaki. Egyptian-grown Malaki, of which the civilian trade before the war had very little experience, is probably now being used almost exclusively for military fabrics, but there seems every reason to believe that after the war it will form a keen competitor to Sea Island in high-quality fabrics, and the competition of Egyptian-grown cotton will be made still keener with the coming into production of Giza 39.

[*Cf.* Abstr. **77**, Vol. XX. of this Review.]

COTTON IN OTHER FOREIGN COUNTRIES.

326. ABYSSINIA: GUIDA PER L'INSEGNAMENTO PRATICO DELLA COLTURA DEL COTONE. (Pubd. by Compagnia Nazionale per il Cotone di Etiopia, 1940.) This booklet is a guide to the practical cultivation of cotton in Abyssinia. It gives instruction for the preparation of the land before sowing; planting the seed; care of the cotton plantation after sowing; cotton pests and diseases; harvesting the crop.

327. ETHIOPIA: NOTES ON AGRICULTURE. By Major F. de V. Joyce. (*E. Afr. Agr. Jour.*, January, 1943, and subsequent numbers.) Opening with a statement of the objects to be achieved by an agricultural policy for the country, the author goes on to discuss the following: Natural features—soils, water and rainfall, grasses, trees and forests, wild life; livestock; food crops; plantation crops; soil conservation; communications, transport and power; agricultural industries. In regard to the cotton industry it is stated that before the Italian occupation of the country the imports of raw cotton, cotton thread, and cotton piece-goods amounted to about 7,500 tons per annum. Italy had many ambitious schemes for stimulating production in Ethiopia, but these were based on the object of making Italy and her Empire as self-supporting as possible, rather than on sound economic development. In view of Ethiopia's indifferent communications, immense consumption of cotton, and the large exports required to balance the import of cotton, the policy should be to stimulate local production, provided this be not done at the expense of the land. The Italians established ginneries at Alomata, Adama, Sodhu, Lechemu, and Diredawa, and at the latter place erected a large spinning and weaving mill capable, it is said, of a maximum production of 9,000 metres of good quality unbleached cloth per day. The factory obtained only a fraction of its raw cotton requirements locally, and imported raw cotton from India, Iran, and elsewhere. Cotton has always been grown in small patches all over Ethiopia at suitable altitudes, and is hand spun and woven into coarse but useful cloth by the countrywomen. This industry should be encouraged in every possible way, and it might be helped by the introduction of a better type of hand loom.

328. ARGENTINA: MEMORIA ANUAL DE LA JUNTA NACIONAL DEL ALGODON, 1941. (Min. de Agr. Argentine, No. 60, 1941.) A detailed report of the state of the cotton industry in the country during the 1940-41 season, and measures taken for its maintenance and improvement. The various sections of the report deal with the following: Production; marketing; the textile industry; work of the Experiment Stations and the Chemistry Laboratory; cotton seed; technology; labour in the agronomic regions; co-operative societies; encouragement of cotton growing in new areas, etc.

329. COTTON PRODUCTION IN ARGENTINA, 1940-41. (*Mem. Anual, Junta Nac. del Algodon, Argentina*, 1941, **60**, pp. 11, 101. From *Summ. Curr. Lit.*, xxiii., **8**, 1943, p. 205.) In the season 1940-41 the area planted with cotton amounted to 336,600 hectares and the area harvested to 298,485 hectares, the latter figure being about 1·3 per cent. higher than the corresponding figure for the previous season. Production amounted to only 50,337 tons of fibre, a reduction of 36 per cent. compared with the previous season. Most of the cotton (75·6 per cent.) was of grades C to E, 30·6 per cent. being grade D. These results are attributed to unfavourable climatic conditions and to shortage of labour for picking. Most of the fibre (92·3 per cent.) had a length of 23-26 mm., 35·5 per cent. being of 24 mm. In Salta about 100 hectares were sown with the variety Coker Wild 11 and produced strong, fine cotton of 32 mm. length. The total number of ginneries in the country was 148, 7 less than in the preceding season, and 126 were in operation during the 1940-41 season. Tables are given showing ginning results and the monthly progress of ginning in the various provinces and territories. Increases in the yield of ginned fibre and further progress in individual ginning are reported. Areas harvested, actual yields of seed cotton and fibre, and yields per hectare are shown for the various provinces and territories.

Yield in Relation to Climatic Conditions.—Climatic conditions in Argentina during the various stages of the 1940-41 cotton-growing season are reviewed and tables are given showing humidity and temperature conditions and yields of fibre and seed

cotton per hectare obtained at various ecological stations with the varieties Delta 11A, Mebane Triumph, Coker Wild 8, Stoneville 5A, Coker Wild Strain 7, Delta 12, Farm Relief 4, Acala Blue Tag, Coker 100, Paymaster, Carolina Foster, and the native Chaco type cotton.

330. BELGIAN CONGO: LE CHOIX DE LA VARIÉTÉ DE COTON DANS LES DISTRICTS DE L'UELÉ ET DE L'UBANGI. By M. Waelkens and M. Lecomte. (*Publ. Inst. Agron. Congo Belge*, Ser. Tech., **29**, 1941. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 242.) A detailed account of the selections of the families 145 and 270 and certain other varieties, their characters and behaviour under different conditions. As a result of the investigation, D65 of family 270 is of most value to the manufacturer, and C55 of 145 to the natives on account of its high yield of seed, but these findings require modification according to the district concerned.

331. BRAZILIAN COTTON. (*Cotton*, M/c, 15/5/43, 12/6/43, 10/7/43.) The 1942-43 cotton season terminated in March, and according to official figures for the Paulista crop, 99·99 per cent. of the total of 281,646 metric tons was of 28-30 mm. staple, or an identical percentage to that for the previous crop. In classification by types, however, only 36·28 per cent. was of basic type 5 or better, against 67·17 per cent. for the previous crop. An outstanding feature was the smaller quantity of seed cotton required to produce a given unit of ginned cotton. In many districts only 44 kilos were required to yield an *arroba* (15 kilos) of clean cotton, compared with from 50-52 kilos only a few years ago.

The yield of the 1943-44 cotton crop of São Paulo is estimated at 350,000 tons. The new cotton crop throughout northern Brazil is expected to be of much better quality than that of last year owing to the general seasonal rainfall. It is stated that the announcement that the Federal Government would finance the 1943-44 Paulista cotton crop on the basis of Cr. $66 per *arroba* of seed cotton has given rise to some dissatisfaction in cotton-growing circles, which had petitioned the Government for an official basis of financing of Cr. $80 per *arroba*.

332. BRAZIL: NEW COTTON CONTRACT. (*Cotton*, M/c, 17/4/43.) In the hope of increasing business on the São Paulo Produce Exchange and, later, of reducing the present cost of term operations, it is reported that the Board of Directors have decided to modify procedure so far as negotiations in cotton are concerned. A new contract was accordingly introduced in November last, and until such time as the existing "A" and "C" contracts expire (the last trading month being July, 1943), it will be called the "*Contracto Unico*." The principal features of the new contract are: Quotations will be made only for 6 months of the year, these "active" months—which coincide with those quoted on the New York and Liverpool markets—being January, March, May, July, October, and December. Later it is intended to quote all 12 months, and the market will then make its own "active" months. The quotations for this contract will be for type 5, but operators will be able to deliver any cotton from type 1 to 7, invoicing with the discount or premium for the type delivered on the day of effective delivery. There are several other innovations which seek to bring procedure in line with that on the New York and Liverpool markets.

333. IRAN: COTTON CROP, 1942. (*Cotton*, M/c, 12/6/43.) Owing to a large-scale shift from cotton cultivation to food crops which was encouraged by the Iran Government, the cotton crop in 1942 amounted to 120,000 bales of 478 lb. each, according to Government estimates, compared with 184,500 bales in the previous season.

334. IRAQ: COTTON INDUSTRY. (*Cotton*, M/c, 28/8/43.) The cotton crop of 1942 is estimated at between 10,000 and 12,000 bales of 400 lb. compared with approximately 19,828 bales in 1941. The acreage was reduced in 1942 to permit increased cultivation of cereals.

335. PARAGUAY: COTTON INDUSTRY. (*Cotton*, M/c, 10/7/43.) Cotton growers are guaranteed for their crop now being harvested a price of 200 pesos per 10 kilograms of seed cotton (equivalent to 2·72 cents per lb.). This new price is 20 pesos (0·28 cent per lb.) higher than the seed cotton price for the 1942 crop, and 50 pesos (0·68 cent) higher than that guaranteed for the 1941 crop. Government has granted these

price increases in order to maintain the farmers' interest in cotton cultivation as an important cash crop of the country.

336. PERU: RESTRICTIONS ON THE MOVEMENT OF COTTONSEED ANNULLED. (*Cotton*, M/c, 25/9/43.) By a recent decree the Peruvian Government has removed the regulation imposed on September 20, 1929, prohibiting the movement of cottonseed from the areas of production in the northern Provinces (Piura, Lambayeque, and La Libertad) to other parts of the country. The original decree was intended to protect the interests of the cottonseed crushers in those Provinces by requiring the seed to be crushed in the valley of production. The new decree permits unrestrained movement of cottonseed throughout the Republic.

Exports of cottonseed have been prohibited since January, 1943, owing to a threatened shortage for local oil mills. This shortage is attributed both to restricted cotton acreage and to increased domestic consumption of cottonseed oil in place of other edible oils formerly imported from Axis-dominated areas.

337. SCIENCE IN SOVIET RUSSIA. By J. Needham and J. S. Davies (Editors). (Watts and Co., London, 1942. Price 1s. 3d. Reviewed *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 172.) In this small booklet edited by the above, Dr. Needham himself contributes an article on Biological Science in the Soviet Union, which includes references to the work of Soviet geneticists such as Koltzov, Iljin and Vassin, as well as a very succinct outline of the "genetics controversy." Special emphasis is laid on the advantage that research in the U.S.S.R. gains over research in most other countries on account of the greater mechanical facilities afforded to it. The chapter on "Soviet Agricultural Science" by Arthur Walton is devoted to the development and expansion of the so-called "pyramid of research personnel" in the investigation of purely practical agricultural problems. The booklet also contains articles on Soviet physical, medical and other applied sciences.

SOILS, SOIL EROSION, AND MANURES.

338. SOIL-FORMING PROCESSES: PEDOLOGY IN THE SERVICE OF SOIL SCIENCE. By J. S. Joffe. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 168.) The author presents pedology as the basis of soil science and suggests that it is to become the stepping-stone in deciphering many soil problems confronting the scientific investigators and practical farmers engaged in the many branches of agriculture. Associating specific and puzzling soil questions with the soil-forming processes, one should be able to recognize the probable reactions of any particular method of managing the soil as a medium for plant growth, the ultimate aim of these studies. Concrete and specific examples are cited, showing how soil investigations of yesterday and even of to-day have not borne the desired fruit, or the results have been meagre because of the detached position of these investigations from the fundamentals of pedology. These fundamentals point to each zonal soil possessing a physicochemical system of its own. Hence, the experimental procedure should differ and the results of the experiments be interpreted accordingly.

339. SOIL GENESIS FROM FRAGMENTAL VOLCANIC ROCKS IN THE LESSER ANTILLES. By F. Hardy and G. Rodrigues. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 169.) The relationships between eight soil types derived from the various fragmental volcanic rocks of the Lesser Antilles, which belong to one petrological province, are presented to bring out the effect of age, rainfall, topography, and porosity as factors in soil genesis and pedological evolution.

340. MECHANICAL COMPOSITION OF EAST AFRICAN SOILS. By G. Milne and W. E. Calton. (*E. Afr. Agr. J.*, viii., **4**, April, 1943, p. 202.) The lack of any consistent relation between mechanical composition of East African soils and their field properties is discussed. An attempt is made to trace the changes in mechanical composition occurring with progressive soil development on various parent materials. Examples are given to show the range of mechanical types found in East Africa.

341. INDIA: BLACK COTTON SOILS, MOVEMENT OF WATER IN. By L. A. Ramdas and A. K. Mallik. (*Proc. Ind. Acad. Sci.*, 1942, A16, pp. 1 and 16. From *J. Text Inst.*, April, 1943, A172.) A simple laboratory method of studying the ascent of moisture

and aqueous solutions through soil is described. The effect of packing on the rate of upward movement is discussed; at maximum packing the rate is one-third of that at minimum packing. The influence of various percentages of sand mixed with the black cotton soil in increasing the permeability and rate of upward movement of moisture is discussed. A small quantity of lithium or sodium carbonate reduces the rise of water, lithium carbonate being the more effective. The swelling of the colloidal material in black cotton soils in solutions of a number of substances is described. Lithium carbonate is the most efficient swelling agent. The effect of prolonged heating is to destroy the organic colloids covering the particles. This leads to the absence of swelling and a marked increase of permeability.

342. The Fractionation of the Organic Matter, Including Nitrogen, of Certain Soils and its Relation to their Quality. By M. R. F. Ashworth. (*J. Agr. Sci.*, **32**, 4, 1941, p. 349.) The proximate analysis of a number of widely differing soil profiles has been carried out, employing a slight modification of the scheme used by Waksman and Shewan. This included a nitrogen fractionation with water and acid, similar to that of Waksman and of Shewan. It was supplemented by ammonia and nitrate estimation. The data are expressed on the basis of total organic matter. The soils ranged in quality from peat and forest soils to grassland profiles. This gradation of quality was brought out by many of the figures of the proximate analysis. The better quality soils are associated with (*a*) a lower average content of fats and waxes, hemicellulose and cellulose; (*b*) a rapid decrease in cellulose with increasing depth; (*c*) higher total nitrogen and various fractions, including higher ammonia and nitrate and a higher ratio of nitrate to ammonia; (*d*) a higher proportion of more soluble nitrogen. The ratio of the average dilute-acid-soluble nitrogen to the average residual nitrogen for the profile as a whole increased regularly with improving quality of soil. In all profiles the total nitrogen and its various fractions generally increased with increasing depth. The water-soluble organic matter and lignin showed no obvious correlation with soil quality. In general, the water-soluble matter decreased with increasing depth. The lignin showed overall increases with depth. The method of investigation used appears to provide a satisfactory approximate picture of the distribution and amount of nitrogenous groups in soil organic matter in fractions which can be associated with soil quality.

343. Phosphate Fixation in Soil and its Practical Control. By F. E. Bear and S. J. Toth. (*Indus. and Eng. Chem.*, **34**, 1, 1942, p. 49. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 167.) Observations of agronomists on crop recovery of applied phosphate within the soil profile, increased response to phosphate fertilization placed in bands, and small loss of phosphate in the drainage water are explained on the basis of phosphate fixation. The factors discussed in connection with phosphate fixation include microbiological consumption, chemical precipitation, and physicochemical adsorption. Fertilizer placement both in bands and below the zone affected by cultivation and summer drought are suggested for increasing the effectiveness of applied phosphate.

344. Adsorption of Chloropicrin and Other Fumigants by the Soil. By F. L. Stark, Junr. (*Phytopathology*, **33**, 1, 1943, p. 12. From *Rev. App. Ent.*, xxxi., Ser. A, **7**, 1943, p. 276.) By means of a microbalance the weight of chloropicrin and other soil fumigants adsorbed by soil particles was determined. The amount of gas adsorbed is dependent primarily on size of the soil particles, soil temperature, and concentration of gas. Heavy soils having a large clay fraction may adsorb chloropicrin up to 10 per cent. of their weight from a saturated atmosphere. Degree of aggregation of soil particles has little influence on either the quantity of gas adsorbed or rate of adsorption. Carbon bisulphide is taken up in smaller quantities than chloropicrin and at a much slower rate than either chloropicrin or formaldehyde. Formaldehyde is adsorbed to a less extent than carbon bisulphide but at about the same rate as chloropicrin. Adsorption probably impairs the efficiency of volatile fumigants by reducing the concentration and the diffusion of vapour in the soil, especially in the case of chloropicrin. Because some soil fumigants are more readily adsorbed than others, the efficiency of one may be impaired more than another when

a heavy soil is treated, which may account for the differences obtained in investigations on the relative effectiveness of various soil fumigants.

345. Effect of the Soil Mulch. By L. L. Eksteen and M. J. van der Spuy. (*Frmg. in S. Afr.*, February, 1941.) From experiments carried out at the Glen College of Agriculture, South Africa, in 1938, it cannot be deduced that a soil mulch has any noticeable effect on the evaporation of moisture from soil in which the underground water level is very deep. The crop yield can be greatly increased by controlling weeds effectively during the early stages. Cultivation of the soil reduces run-off. Soils cultivated to a rough, broken surface do not easily become wind-blown.

346. Soil Moisture and Wilt Disease. See Abstr. **419.**

347. Germination of Cottonseed as Affected by Soil Disturbance and Machine Placement of Fertilizer. By H. P. Smith *et al.* (*Bull. No.* 616, Texas Agr. Exp. Sta., 1942.) Experiments were conducted at College Station and Nacogdoches from 1936-40 inclusive to determine the effect of machine placement of fertilizer and the effect of soil disturbance on the germination of cottonseed. When a 4-12-4 commercial fertilizer was placed under the seed at depths of 1, 2, and 3 inches below the seed there was an increase in the percentage of emergence and yield. Fertilizer placed directly under the seed at the time of planting injured the root system and in most cases stopped the development of tap-roots at the level of the band of fertilizer. When only the soil was disturbed directly under and at the several depths below the seed, the percentage of germination decreased with the depth of the disturbance. Where fertilizer was not applied normal tap-roots developed. The best emergence and stands were obtained when the fertilizer was placed 2 inches to each side and 1 and 2 inches below the seed level. In all the side placement tests the root systems of the young seedlings were not injured, and normal tap-roots developed.

348. Cotton Plant: Utilization of Nutrient Materials. By S. A. Kudrin. (*Chem. Soc. Agr., U.S.S.R.*, **9**, 6, 1940, p. 12. From *Summ. Curr. Lit.*, xxiii., **7**, 1943, p. 170.) The cotton plant utilizes nitrogen better from mineral fertilizers than from manure, whilst the reverse is true of phosphorus. If the two forms of fertilizers are mixed the utilization of both N and P is somewhat increased. Both N and P are utilized better from oil cake. In the experiments reported, the utilization of N was 30 to 60 per cent. and that of P 15 to 30 per cent. Whilst it is difficult to improve utilization above these values, it can be accomplished by proper choice of the form of fertilizer and careful application.

349. A Chemical Study of Quick-Test Techniques for Potassium and Calcium. By S. W. Melsted. (*J. Amer. Soc. Agron.*, **34**, 6, 1942, p. 533. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 149.) This article covers a chemical evaluation of various techniques involved in quick tests for potassium and calcium. The author points out that the principal factor which determines the accuracy of a quick test for replaceable bases is the quantitativeness with which the extracting solution removes the bases from the soil. With this in mind, it is suggested that the first consideration must be the extracting solution. Results obtained indicate that there is no one extracting solution in use for rapid tests that is quantitative for all the replaceable bases, and in the opinion of the investigator, a single extracting solution now in general use for all nutrients should be discouraged. The limitations of quick-test methods that measure the aliquot of extract in drops, as well as turbidimetric or colorimetric methods that do not give accurate results with standard solutions, are discussed.

350. Central Asia: Effect of Potash on Cotton Plant. By E. A. Zhorikov. (*Chem. Soc. Agr., U.S.S.R.*, **9**, 6, 1940, p. 17. From *Summ. Curr. Lit.*, xxiii., **7**, 1943, p. 170.) On the grey soils of Central Asia which are not high in salts the use of K salts increased the cotton yield 8 to 20 per cent. Such treatment was not effective on the salty soils. The growing of alfalfa sharply reduced the readily assimilable K; after ploughing under, it gave the best base for the application of K fertilizer. With the use of 90-100 kg. per ha. of N and P the optimum amount of K_2O was 45-50 kg. per ha. Larger doses of K_2O (75-100 kg. per ha.) required the use of about 200 kg. of N and P or the planting of alfalfa as a green crop. The ratio of N : K was 2 : 1 for old fields and 1 : 1 after a crop of alfalfa. The best results were obtained by using

40-50 per cent. of the yearly dose of K at the time of planting and the remainder at the time of budding or blooming.

351. GEORGIA: THE INFLUENCE OF NEUTRALIZING ACID-FORMING FERTILIZERS WITH DOLOMITE LIMESTONE ON THE RESPONSE OF COTTON TO POTASH. By J. G. Futral and J. J. Skinner. (*Ga. Sta. Bull.* 223, 1942. From *Exp. Sta. Rec.*, **88**, 6, 1943, p. 739.) Seven soil types were included in a comparative study of acid- *v.* non-acid-forming fertilizers, the non-acid-forming fertilizers having been neutralized with dolomitic limestone. The effect of the dolomitic limestone on potash availability was determined with cotton. Fertilizers containing dolomitic limestone gave larger yields of cotton than acid-forming fertilizers on Cecil fine sandy loam, Clarksville gravelly loam, and Norfolk and Appling sandy loam soils. Only a small increase in yield resulted from non-acid-forming fertilizers over acid-forming on Orangeburg, Tifton, and Greenville sandy loams. Using dolomitic limestone to neutralize acid-forming fertilizers resulted in practically the same increase in yield without regard to the potash content of the fertilizer. The authors thus conclude that neutralizing acid-forming fertilizers with dolomitic limestone does not materially affect the crop's response to or requirement for potash.

352. PREPARATION AND USE OF ARTIFICIAL MANURES. By K. J. Kucinski. (*Massachusetts Sta. Bull.* 395, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 165.) Corn stover, mixed deciduous leaves, oat straw, and mixed leaves and garbage were used in making artificial manure. The author discusses methods of preparation for small- and large-scale amounts. Data are presented on the rate of decomposition, heat and moisture relationships, chemical analyses of the products, and volume and appearance of the finished product, as well as results from pot and field experiments. Both chemical and vegetation tests showed that when cyanamide or ammonium sulphate was used in the preparation of manure from corn stover, oat straw, or leaves and garbage, a finished product resembling well-rotted farmyard manure was obtained. Leaves used alone decomposed to form artificial manure very slowly, while corn stover decomposed most rapidly.

353. GROUND LIMESTONE AND SOIL FERTILIZERS. (*Trop. Agr.*, April, 1943, p. 84.) It is considered in Illinois that the most economical grinding of limestone is probably that which provides a gradation of sizes finer than 6-mesh. A small amount of coarser material up to 4-mesh ($\frac{1}{4}$ inch) is permissible, although the action of such coarse material is very slow. It was found to take about a year or eighteen months for soil to have its acidity reduced appreciably throughout a range of about $\frac{1}{2}$ inch from a fixed mass of limestone. In pasture experiments limestone was the most effective single agent in increasing the total growth of forage over the whole grazing season, a combination of limestone and phosphate being more effective than was either material alone.

354. COTTONSEED MEAL ASH AS A FERTILIZER. By P. Correa de Mello. (*J. Amer. Soc. Agron.*, **34**, 7, 1942, p. 677. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 168.) Due to the loss of northern European markets for cottonseed meal, the price has declined to the point where the producers of the meal are beginning to use it as a fuel, which results in a fertilizer material known as cottonseed meal ash. Cottonseed meal ash is made up in its entirety of phosphates, potash, magnesium, and calcium, with the amount of carbonate practically insignificant. Its value as a fertilizer has been confirmed by some of the producers in various ways, and for this reason the author decided to prepare this brief article in order to dispel whatever doubt exists as to its true value as a fertilizer. He presents the following analysis as representing typical cottonseed meal ash: SiO_2 0·92 per cent., P_2O_5 43·60, K_2O 32·70, MgO 17·80, and CaO 5·70 per cent.

355. A QUICK METHOD OF MAKING HUMUS. (*Trop. Agr.*, February, 1943, p. 44.) A system of composting is described in the *New Zealand J. Agr.*, **64**, 125, whereby complete breakdown of material is achieved in a few weeks. The method differs from ordinary composting only in the introduction of air vents into the base of the heap. The humus-making plant described is an above-ground receptacle of cement and boulders 8 ft. by 3 ft. and 2 ft. 9 in. deep, divided midway by a partition. At the

bottom of each container a 12-inch square is dug and covered with heavy wire netting. Leading to the outside from each 12-inch square is a 9-inch pipe. The indraught of air through these pipes appears to stimulate the heating process. Larger pipes slow down combustion. Material placed in one container is turned into the other in 3 weeks and is ready for use in a month or six weeks later. Wood shavings and sawdust, if used in small quantities, quickly disappear.

356. Changes Occurring in the Organic Matter during the Decomposition of Compost Heaps. By M. R. F. Ashworth. (*J. Agr. Sci.*, **32**, 4, 1941, p. 360.) The decomposition of the organic matter of four medium- to large-scale composts has been studied by analysis of samples taken at intervals. The bulk materials of the composts were grass-cuttings, oat-straw, *Sphagnum* peat and an *Eriophorum* and *Sphagnum* peat. All were made up to the same nutrient content and relative water content. The analytical method used was a modification of the scheme of proximate analysis used by Waksman and by Shewan. It was supplemented by ammonia and nitrate determinations, using Olsen's method. The following observations were made:

A. *All Composts.*—(i) An increase in ammonia, water-soluble nitrogen, and water-soluble organic matter took place during the first month. (ii) Only low nitrate concentrations were developed. (iii) Very closely parallel changes in H_2SO_4-soluble nitrogen and residual nitrogen were recorded. (iv) Other nitrogen changes can be described as slight and on the whole as mutually compensating fluctuations.

B. *Peat Composts.*—(i) The changes in the two peat composts were similar and were confined chiefly to the nitrogen fractions during the first month of composting, the less soluble nitrogen tending to become converted to more soluble forms. (ii) Insignificant changes were recorded in carbohydrates, lignin, and fats and waxes. (iii) It seems likely, therefore, that in the peat compost heaps the changes recorded were confined chiefly to the dried blood added as a source of nitrogen. The peat itself was scarcely affected.

C. *Grass and Straw Composts.*—(i) Changes were not regular but showed temporary fluctuations which were most pronounced in the nitrogen content of the grass and of its fractions. (ii) Decomposition of hemicellulose and cellulose occurred during the first month in the grass compost, which at that time developed a high temperature. In the straw compost, which did not heat well because of its open structure, this decomposition occurred in the second month. (iii) A small overall increase of lignin took place. (iv) Increases in total nitrogen were recorded. (v) In the straw compost early accumulation of ammonia was accompanied by losses of HCl-soluble nitrogen, and after the first month these changes were reversed. The corresponding changes in the grass compost were not so apparent.

In composting, the grass and straw underwent changes which increased their resemblance to dung—*e.g.*, carbohydrate breakdown, accumulation of lignin and nitrogenous matter. On the other hand, the peats remained more or less unaltered. It is concluded, therefore, that these peats did not compost, and that the chief value of peat in the compost heap is as an absorbent of water-soluble nutrient—*e.g.*, ammonia—liberated during the process of composting.

357. La Accion Toxica del Selenio. By J. E. Wille. See Abstr. **383** in this issue of the Review.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

358. Statistical Analysis in Biology. By K. Mather. (Methuen and Co., Ltd., London, 1943. 16s. Reviewed *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 272.) This is a book written by a biologist for biologists, and is a good introduction to the use of most methods of statistics which are required by them. The author has succeeded in reaching a satisfactory compromise between the type of book which is so mathematical as to be unreadable by the biologist, and the opposite type which is a pure catalogue of methods to be used by rule of thumb. After an introductory chapter on the nature of statistics, populations and samples and diagrams, and another on

probabilities and significance, an account is given of the normal, binomial and Poisson distributions. A description is then given of the t, z and X^2 distributions and their interrelations. There follow chapters on the significance of sums and means, degrees of freedom and the analysis of variance, the planning of experiments, regressions, and correlations. The use of X^2 in the analysis of frequency data is described fully, and finally there is an account of the estimation by the method of maximum likelihood. The reviewer agrees with the author that the biologist should be able to understand a certain amount of algebra, and that some elementary algebra on topics such as the partitioning of degrees of freedom or the partitioning of X^2 should be helpful towards understanding the general methods. It is thought, however, that the arrays of degrees of freedom given are needlessly long, and may easily put the reader off the subject. Secondly, if algebraic proofs are given, they should be as easy and concise as possible; in this connection the algebra of the partitioning of X^2 presented on pp. 177, 179, 198 and 199 is most laborious and inelegant. The examples chosen to illustrate the arguments are in general quite good, but the preponderance of examples from genetics in some of the chapters is unfortunate but perhaps unavoidable. It is felt that the inclusion of a chapter on the treatment of toxicological data by the method of probits would have enhanced the value of the book, and a short section on other transformations of variates would be useful. Finally, in spite of the above criticisms, this book can be strongly recommended to all biologists.

359. Statistical Tables for Biological, Agricultural and Medical Research. By R. A. Fisher and F. Yates. (Oliver and Boyd, Ltd., London and Edinburgh, 1943. 2nd edn. 13s. 6d. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 272.) In this second edition the new material consists of two further tables (V_1 and V_2) for the test of the significance of the difference between two means obtained by different methods: Table VIII, which gives upper and lower limits for the expectation based on the binomial and Poisson distributions when a occurrences out of N have been observed, and Table $VIII_2$, which gives densities of organisms estimated by the dilution method. The combinatorial solutions of Table XVII have been considerably extended and simplified in presentation by the more extensive use of solutions of the cyclic type, while the corresponding section of the introduction now gives an account of Youden's Squares and of the method of utilizing information, formerly discarded, from comparisons between blocks. A list of errata in the first edition has also been included.

[*Cf.* Abstr. **456**, Vol. XVI. of this Review.]

360. Chemistry and Agricultural Reconstruction. By Sir E. J. Russell. (*Trop. Agr.*, April, 1943, p. 74.) From the Messel Lecture delivered before the Society of Chemical Industry and reprinted from *Chemistry and Industry*, vol. 61, 30, the introductory remarks which include references to agricultural production in England and Wales have been omitted. The present section of the paper discusses the following: The food production problem; the achievements of the chemist—(*a*) the empirical period, (*b*) the scientific period; the difficulties of applying science to agriculture—(*a*) natural difficulties, (*b*) difficulties removable by administrative action; administrative changes; difficulties not confined to agriculture; agricultural science and its applications in the reconstruction period. The author writes in conclusion: "It seems clear that the application of science to agriculture in the future will be on a wider basis than in the past. It will no longer suffice simply to know how a particular nutrient or treatment affects the yield; the effect on composition must be studied, and on the intrinsic and the market values of the crop and its reaction to disease organisms. Like everyone else the chemist must specialize, and so he cannot be expected to become expert in a number of different sciences. But he must cultivate the art of working with other people. As the years go by this need will become more insistent, and success will go to those who have the gifts of co-ordinating the efforts of different scientific workers and of synthesising into a coherent pattern the multitudinous fragments of truth that they succeed in finding."

361. The Design of Experiments. By R. A. Fisher. (Oliver and Boyd, Ltd., London and Edinburgh, 1942. 3rd edn., 12s. 6d. From *Pl. Bre. Abs.*, xiii., **3**,

1943, p. 272.) The third edition of this valuable book differs little from the second edition. Sections have been added on the possibilities of confounding with many factors and on the method of double confounding.

[*Cf.* Abstr. **463**, Vol. XIV. of this Review.]

362. New Cyclic Solutions to Problems in Incomplete Blocks. By R. A. Fisher. (*Ann. Eugen.*, **11**, 1942, p. 290. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 177.) Cyclic solutions are given for the problems of randomized blocks and Youden's squares for the cases associated with completely orthogonal 8×8 and 9×9 squares. An examination of the 9×9 squares derived from the second solution shows that there is only one species of Latin square, but two species of tetrics, Græco-Latin squares, and two species each of pentics and hexics. The solutions hitherto given of orthogonal 9×9 squares appear both to be the same as that derivable from the cyclic solution.

363. Crop Rotation as a Factor in Soil Erosion Control. By R. J. Carreker. (U.S. Dept. Agr., *Agr. Eng.*, **23**, 6, 1942, p. 190. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 164.) Work from 1930-35 at several soil and water conservation experiment stations has shown that soil loss from corn in a rotation with close-growing crops was less than from corn after corn, and similar results were obtained with cotton. Recent work at the Southern Piedmont Experiment Station at Watkinsville, Georgia, indicated that considerable reduction in soil loss and improvement in crop yields may be obtained by rotating cotton with other crops. Of special merit are (1) the 3-year rotation of cotton, oats-lespedeza, and lespedeza, and (2) the contour-balk system of cotton culture.

364. Delinting and Treating Cotton Seed in Georgia, 1938-41. By U. R. Gore. (*Ga. Sta. Circ.* 141, 1943. From *Exp. Sta. Rec.*, **89**, 1, July, 1943, p. 80.) Anthracnose-infested seed averaged an increase of 159 lb. seed cotton to the acre from Ceresan treatment. Machine delinting or reginning gave an increase of 167 lb., and reginning plus the chemical treatment an average increase of 250 lb. seed cotton per acre over the fuzzy, untreated seed. Planting of about 1 bushel of reginned seed per acre is recommended. Either New Improved Ceresan or Ceresan proved effective dusts for cottonseed, which may be treated at any convenient time and stored in a dry place until planted. It is good insurance any season to treat with organic mercury dusts. Being poisonous, treated seed should not be fed to stock or sold for oil. Seed heated in storage or damaged seed of low vitality should not be planted. Ample planting seed should be saved, since 2-year-old seed is practically disease-free and seed will be available should replanting be necessary.

365. La Cosecha Mecanica del Algodon. By R. G. Mata and R. A. Franchelli. (*Bull. No.* 62, Min. de Agr., Buenos Aires, Argentina, 1942.) Discusses the social and technical problems of the manual cotton picker, and also the problem of the mechanical cotton picker *v.* the rural worker. The results are described of experiments carried out in the United States in connection with the "Rust" cotton picker, and also of experiments during 1938 to 1942 in the United States and Argentina with the "International" model. The bulletin concludes with a discussion of the efficiency of the mechanical cotton pickers and the costs of installation.

[*Cf.* Abstr. **503**, Vol. XV. of this Review.]

366. Relationship of Certain Characteristics of Seed Cottons to Ginning. By W. S. Smith *et al.* (*J. Agr. Res.*, **66**, 6, 1943, p. 249.) Tests were conducted to ascertain whether certain American Upland cottons differed in respect to the time and energy required for ginning and, if so, to ascertain whether variations in certain seed-cotton properties were responsible for these differences. Planting of sixteen varieties in both 1936 and 1937, and a seventeenth in 1937 only, provided seed cotton for 184 test lots of 30 lb. each—3 for each variety in 1936 and 8 for each variety in 1937. Varieties were found to differ significantly in the time and net energy required to gin either 30 lb. of seed cotton or enough seed cotton to produce 10 lb. of lint. The larger and more fuzzy-seeded cottons required more time and energy to gin than the smaller and less fuzzy-seeded varieties. Apparently the large and fuzzy seeds are not discharged from the roll box during ginning as rapidly as smaller and

less fuzzy seeds. Varieties with a high lint percentage required less time and energy to gin 10 lb. of lint than varieties with low lint percentage. Lint percentage, however, had little effect upon the energy required to gin 30 lb. of seed cotton, but did affect the amount of time consumed, an increase in lint percentage tending to be accompanied by an increase in the amount of time required. The order of influence of the three seed-cotton properties follows. Time required to gin 30 lb. of seed cotton or 10 lb. of lint: (1) percentage of fuzz, (2) lint percentage, and (3) seed size. Net energy required to gin 30 lb. of seed cotton: (1) amount of fuzz, (2) seed size, and (3) lint percentage. Net energy required to gin 10 lb. of lint: (1) lint percentage, (2) amount of fuzz, and (3) seed size. Strength of fibre attachment to the seed had no effect upon the energy required to gin these particular cottons.

367. Cotton Feeding Equipment Control. By R. S. Baden. (*Instruments*, 1943, **16**, 35. From *Summ. Curr. Lit.*, xxiii., **10**, 1943, p. 267.) In the opening room of a southern textile mill (U.S.A.) cotton is removed from the bale and is fluffed up into a loose condition by special machinery. At times the cotton flowing into this machinery accumulates to such an extent that it overflows from the bin on to the floor, making it necessary to replace it manually in the feeder hopper. To shut down the feeding equipment a lever-actuated mercury switch was applied which would trip when the cotton in the bin reached a predetermined level. Since the mercury switch was being constantly tripped by the continuously rotating cotton in the bin, constant starting and stopping of the feeding machinery occurred while the bin was full. The problem was solved by supplementing the mercury switch with an electron tube type time delay relay (General Electric Co.). Once the mercury switch has initiated a shut-down period, this relay shuts down the cotton-feeding equipment for a pre-selected period, irrespective of the opening and closing of the mercury switch. After the time period has elapsed, the mercury switch can again start up the feeding equipment.

368. Cotton Gin Air Blast System. Lummus Cotton Gin Co. (U.S.P. 2,275,755. From *J. Text. Inst.*, February, 1943, A69.) A cotton gin comprises a mote conveyor housing an air blast nozzle supplied from an air duct, a lint duct, and an induced air nozzle defined between the bottom of the conveyor housing and the top of the air duct, with means at its inner end for directing the induced air blast so as to divert foreign matter away from the lint duct.

369. Cottonseed Protein for Adhesives: Chemical Studies. By C. Dorman. (*Miss. Farm Res.*, **5**, 9, 1942, p. 3. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 154.) Attention has been given to improving the methods of extraction and purification, obtaining manufacturing cost, and improving methods for using the protein as an adhesive for plywood. Some preliminary tests made on plywood glued with cottonseed protein are promising.

MACHINERY.

370. Cotton Harvesting Machine. By C. E. Brown and A. M. Hanauer. (Pittsburgh. U.S.P. 2,302,180. From *Summ. Curr. Lit.*, xxiii., **10**, 1943, p. 266.) The claim is for the means by which the needles are driven on the picking cylinder of a harvesting machine. The needles are arranged in pairs along the cylinder.

371. Cotton Harvesting Machine. International Harvester Co. (*Text. World*, 1943, **93**, 1, p. 104. From *Summ. Curr. Lit.*, xxiii., **10**, 1943, p. 265.) An improved cotton picker is described which takes the form of a machine attachment designed for mounting on a medium-sized tractor which provides the power for the picking operation. The picking element consists of a drum box housing two drums, each containing a series of vertical shafts. Mounted on these shafts are a large number of revolving spindles which gather the cotton. The spindles enter and retract in the cotton plants and take the cotton from the open bolls without disturbing the unopened bolls or otherwise injuring the plants. After the cotton fleece has been wound on the spindles it is removed by rubber strippers or doffers, conveyed by vacuum to a separating chamber, and then by air pressure, produced by fan equipment, to a large wire netting basket supported on a light framework on top of the machine, where it is held until ready to be dumped for conveying to the gin. When the tractor

is used with the picker, the high rear tractor wheels become the front wheels of the machine and the customary forward speeds of the tractor are available for travelling in the reverse direction. Field tests have shown that the picker harvests as much cotton in a day as can be picked by from 50 to 80 field hands.

372. Cotton Picking Machine. By T. A. Dicks. (Pittsburgh, U.S.P. 2,293,495. From *J. Text. Inst.*, May, 1943, A231.) Two sets of spindles move on endless bands so as to present a picking zone in which they move longitudinally with respect to the machine as it moves forward, and a blast of air is made to play on the cotton in this zone to remove foreign matter.

373. Cotton Picking Machine. By W. N. Smith. (Dallas, Texas, U.S.P. 2,279,598. From *J. Text. Inst.*, March, 1943, A118.) In a cotton picking machine having opposed reciprocating banks of picking needles, the needles are rotated by means of balls that work along helical grooves in their shanks.

[*Cf.* Abstr. **123**, Vol. XX. of this Review.]

374. Cotton Picking Spindle: Manufacture. (International Harvester Co., U.S.P. 2,290,222. From *J. Text. Inst.*, May, 1943, A231.) The claim is for a method of forming teasle-like teeth on the spiked spindles of a cotton-picking machine.

375. The Shirley Analyser. (*Text. Mnfr.*, lxix., April, 1943, p. 163.) This machine provides a means of obtaining definite figures concerning the proportions of clean cotton in any sample; it also enables spinners to obtain an idea of the capabilities of existing machinery on a particular class of material, and to determine the state of cleanliness of the product at any stage in the opening and cleaning processes up to and including carding. The use of streamline airflow is the prominent feature of the machine. The sample to be tested is fed to the taker-in revolving at high speed. A streamer plate underneath the taker-in regulates the air stream; the space below the taker-in is enclosed to form a settling chamber, the front partition extending to within a few inches of the lower face of the feed plate, thus forming an air inlet, and the back partition extending to a point close to the taker-in, providing an outlet from the chamber. A high-speed cage draws air partly from the front of the machine by way of the top of the settling chamber and partly from the open space at the delivery end of the machine. The exhaust duct of the fan is fitted with an adjustable air control valve of the diaphragm type by means of which the air flow can be correctly regulated. The delivery arrangement consists of a plate with its upper edge fitting closely to the cage surface of the dampered portion of the cover, the lower part extends inside the delivery box. The separation of the cotton and impurities takes place as the two travel with the air stream through the settling chamber. The heavy particles fall almost straight from the air stream to the tray. The cotton fibres, being more buoyant than the trash, are controlled by the air stream and carried along with it and out of the chamber on to the cage surface; the dust is sucked through the cage perforations; the cotton forms a layer on the cage surface and travels forward with the cage. When the foremost portion of the layer of cotton comes through the dampered portion of the cage it is pushed forward by the rear portion on to a delivery plate. An air stream admitted between the delivery plate and the cage helps to strip the layer from the cage; ultimately the cotton moves forward to the delivery box.

376. Some Textile Finishing Machines. By K. S. Laurie. (*Text Mnfr.*, lxix., April, May, 1943, pp. 176, 222.) A discussion of the following: the extended use of stainless steel; dye-jigger driving at constant speed; moisture removal by mechanical and by heat methods; tensionless drying; controlled cloth dimensions; automatic feeding of cloth; calendar developments. The paper is well furnished with photographs and diagrams of the machines described.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

377. General Entomology. By S. W. Frost. (McGraw-Hill Book Co., New York and London, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 218.) This work, intended as an advanced text, is presented in twenty-three chapters, each accompanied by a copious bibliography. Field keys to the immature forms of the orders

of insects exclusive of eggs and pupæ and to the common groups of lepidopterous and coleopterous larvæ, material on classifications of insects, and a list of general entomological texts and other important references, are given in an appendix.

378. COTTON INSECT PESTS: CONTROL. By J. C. Gaines. (*Iowa Sta. Coll. J. Sci.*, **1942, 17,** p. 63. From *J. Text. Inst.*, May, 1943, A229.) A report is given of studies of the migration from other hosts to cotton, factors influencing the population on cotton plants, and methods of controlling the cotton flea-hopper, cotton bollworm, Mexican cotton boll weevil, and thrips.

379. BIOLOGICAL CONTROL OF INSECTS. By H. Nicol. (*Pelican Book*, No. A113. Penguin Books, Ltd., Harmondsworth, Mddx., 1943. Price 9d. From *Rev. App. Ent.*, xxxi., Ser. A, **4,** 1943, p. 162.) This is a popular account of the various ways in which natural enemies have been used for the control of insect pests, and of the investigations that were necessary before satisfactory results were obtained. Much of it is devoted to accounts of searches for and the liberation of parasites and insect and other predators, the examples being selected to illustrate the various techniques adopted in response to different problems, but other biological methods, such as the use of disease organisms, trap-crops and cultural measures that affect the interaction of the life-cycles of the pest and its food-plant or that alter the physical environment of the pest, are also discussed. Information is given on the ways in which insects are reared on a large scale for liberation, with some of the difficulties that must be overcome and the precautions that must be taken, and other chapters deal briefly with the structure and habits of insects, parasitism, and the influence exerted on biological control by the occurrence of different races among individual insect species. The complexity of the natural balance between a species and its environment and the consequences that may ensue when it is disturbed are discussed with reference to biological control, and a further chapter is devoted to the limitations to this method of control. Accounts are also given of the control of noxious weeds in Australia, South Africa, and elsewhere by means of insects.

380. CALIFORNIA COTTON INSECTS. By G. L. Smith. (*Bull. Calif. Agr. Exp. Sta.*, 660. Berkeley, Calif., 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **7,** 1943, p. 286.) The cultivation of cotton in California has increased rapidly of recent years, but in some districts insect pests have caused serious losses. Since comparatively little is known of cotton insects in this region, investigations on them were begun in 1935, and notes on their habits and control are given in this bulletin. The most important pest in the San Joaquin Valley is *Lygus hesperus*, Knight, which migrates to cotton from lucerne, weeds and other plants. Feeding by the nymphs and adults causes increased shedding of buds, flowers, and small bolls, a late crop, much of which is not mature when frost and rains occur, destruction of the seeds or reduction of their oil content or germinating power, and the production of abnormal bolls, weak and discoloured lint, or deformed plants. Methods to ascertain the presence of this Capsid in injurious numbers are described, and it is suggested that, to decrease damage, lucerne should be cut as often and as early as possible and weeds should be destroyed during April and May and in November. Of nine dusts tested, sulphur and Paris green (12 : 1) and sulphur and calcium arsenate (2 : 1) gave the greatest measure of control. Insecticides should not be applied between about sunrise and mid-afternoon, or the crop from that day's flowers will be lost. *Chlamydatus associatus*, Uhl., was much the most numerous of the other Capsids on cotton in the San Joaquin Valley, where burweeds (*Franseria* spp.) are its preferred food plants. Both nymphs and adults feed on the more succulent leaves, buds, flowers and stems, causing premature opening of bolls, weak fibre, and numerous undeveloped seeds. To prevent infestation burweeds should be burnt during autumn and winter to destroy the eggs, and the spring growth near cotton fields should be destroyed. Capsids of potential importance are *Psallus seriatus*, Reut., and *Creontiades femoralis*, Van. D. The Pentatomid, *Chlorochroa sayi*, Stal., is destructive in Imperial and Riverside counties, but is rarely injurious in the San Joaquin Valley. Over-wintering adults live about 8 months, and those that develop in spring and summer 2 or 3 months. The female lays an average of 150 eggs, in several clusters, the egg state varying from

5 days in July to 15 in spring. *Telenomus mesillæ*, Ckll., parasitizes an average of 48 per cent. of the eggs, and Tachinids about 3-5 per cent. of the adults. The bugs feed principally on seeds, and prefer plants other than cotton. Small numbers may do considerable damage, however, since they feed on many bolls in various stages of growth, causing shrivelled seeds and unpickable fibre, and sometimes disseminate fungi that cause boll rot. Preferred food plants should not be destroyed when the bolls are developing (in late June-October), but in early winter and spring and immediately after harvest in grain fields. The use of chemicals for control is difficult, but dusts of dinitro-o-cyclohexylphenol mixed with sulphur have shown promise; they should not be used after mid-August until more is known of their staining effect on cotton. Two other Pentatomids, *Thyanta custator*, F., which is usually scarce in California, and *Euschistus impictiventris*, Stal., which is of importance in Riverside and Imperial counties, cause similar but more severe injury, and the Pyrrhocorid, *Euryophthalmus convivus*, Stal., occasionally causes serious damage to cotton bolls. *Nysius minutus*, Uhl., sometimes kills or seriously injures seedling cotton. It breeds chiefly in grassland, and burning grass and weeds on the edges of fields, and frequent cultivation, irrigation, or flooding kill many of the nymphs. Sprays of 1 U.S. pint nicotine sulphate and 4-5 lb. fish-oil soap in 100 U.S. gals. water, or a dust of 25 per cent. calcium cyanide are also recommended. *Aphis gossypii*, Glov., is injurious in some districts, and *A. medicaginis*, Koch, destroys young seedlings but is seldom found on older cotton. *Trialeurodes pergandei*, Quaint., is the only Aleurodid of much importance in cotton fields. It develops on *Euphorbia ocellata*, which should be destroyed before July. *Hercothrips fasciatus*, Perg., feeds on cotton leaves and soft stems. With good coverage, dusts containing dinitro-o-cyclohexylphenol have given very good control. Another thrips, *Frankliniella occidentalis*, Perg., occurs on cotton throughout the season and stunts the plants. Several species of Lepidoptera are prevalent, and dusts or sprays of arsenicals or fluosilicates are recommended against most of them. The eggs of *Strymon melinus*, Hb., are laid singly on the succulent growth, and larvæ of this Lycænid destroy flower buds, small bolls, and occasionally succulent stems, and facilitate the introduction of boll rots. Over-wintering pupæ on dead plants can be killed by burning or ploughing under stalks and weeds. The larvæ of *Prodenia præfica*, Grote, usually migrate from lucerne to cotton, on which they destroy the leaves, stems, and bolls. Control measures include thorough cultivation to kill over-wintering pupæ, trapping the migrating larvæ by means of ditches, and the use of poison baits. *Heliothis armigera*, Hb., feeds on the bolls, and *Peridroma saucia*, Hb., and other cutworms occur in cottonseed trash and late bolls, feed on the leaves, and kill seedlings; the former should be controlled by ploughing and working the fields and cleaning up weeds in the spring, and the cutworms by poison baits. *Plusia* (*Autographa*) *californica*, Speyer, does not cause serious damage, but retards growth. Larvæ of *Celerio lineata*, F., which migrate from other plants, kill cotton seedlings by feeding on the leaves and stems, and can be kept out of fields by barrier ditches. *Laphygma exigua*, Hb., defoliates cotton plants in May and late July or August; and *Estigmene acræa*, Dru., causes injury in late summer. *Bucculatrix thurberiella*, Busck., defoliates the plants, and causes shedding of buds, flowers, and small bolls. *Diabrotica undecimpunctata*, Mannh. (*soror*, Lec.), is a minor pest, and feeds on the leaves, flowers, and buds. Germinating seeds and seedlings are attacked by the larvæ, and seedlings by the adults, of small Tenebrionids, of which *Blapstinus rufipes*, Casey, is the most important in the San Joaquin Valley. Control measures suggested are poison bran baits, heavy dusting of plants with lime, or light dusting with calcium arsenate or cryolite, and treatment of seed with organic mercury compounds. The large adults of the Tenebrionid genus *Eleodes* sometimes migrate from pasture and cause localized damage to cotton seedlings, which can be protected with barriers of straw or refuse that is later destroyed, steeply banked loose soil with post holes, ditches containing water or oil and water, or poison baits. The mites, *Tetranychus bimaculatus*, Harvey, and *T. telarius*, L., feed on the leaves of cotton that is well watered or growing near neglected ditches, roadsides, lucerne fields or deciduous fruit trees, and should be controlled by field sanitation or thorough treat-

ment with sulphur or dinitro-o-cyclohexylphenol dusts. Brief notes on insects of little importance on cotton in California, on predaceous insects commonly found on it in the San Joaquin Valley, and a list of important cotton pests that are not found in California, are appended.

381. Control of Hemipterous Cotton Insects by the Use of Dusts. J. R. Eyer and J. T. Medler. (*J. Econ. Ent.*, **35**, 5, 1942, p. 630. From *Rev. App. Ent.*, xxxi., Ser. A, **6**, 1943, p. 238.) Of the Rhynchota that injure cotton in the irrigated valleys of southern New Mexico, the most important are *Adelphocoris superbus*, Uhl., and species of the genera *Lygus* and *Chlorochroa*. In a randomized block experiment at State College in 1941 substantial increases in yield of seed cotton were obtained with dusts of Paris green and sulphur and calcium arsenate and sulphur, but not with sulphur alone. These arsenical-sulphur combinations also produced relatively high mortalities of *C. sayi*, Stal., *L. hesperus*, Knight, and *A. superbus* in large field cages; sulphur alone was again ineffective.

382. Madras: *Thevetia neriifolia* as a Contact Insecticide. By C. Vijayaraghavan. (*Ind. Frmg.*, iii., **12**, 1942, p. 650.) Investigations carried out by the Government Entomologist to determine whether the insecticides that are now difficult to obtain could effectively be substituted by any of the locally available plant poisons have resulted in the discovery of a powerful contact insecticide in the kernels of *Thevetia neriifolia*. A native of South America and the West Indies, this plant has been grown in India for many years. In South India it is commonly grown as a hedge plant. Aqueous extracts of the kernel prepared by mashing or grinding and then steeping in cold water for 24 hours have been found to be highly toxic against a wide range of insects. Optimum strengths for soft- and hard-bodied insects have been studied. A strength of ½ oz. of the kernel in 1 gal. of water is sufficient to kill plant lice, thrips and leaf hoppers. Half an ounce in 1 gal. of water is required against the defoliating caterpillars like the moringa hairy caterpillar and the castor semi-looper, while 1 oz. of the kernel in 1 gal. of water is necessary for the control of mealy bugs and scale insects. To obtain the maximum effect, the addition of soap equal in quantity to that of the kernel used is necessary. Plants sprayed by aqueous extracts of the kernel have been found to be immune from insect attack for short periods. No injury is done to the foliage when the concentration is less than 1 oz. per gal. In addition to the kernel, the cake and oil of *Thevetia neriifolia* possess toxicity of varying degrees. *Thevetia* oil has been found to act as a deterrent against termite attack.

383. La Accion Toxica del Selenio. By J. E. Wille. (*Bol. Direc. Agr. Ganad. Peru* 14 (1940-41), Nos. 36-43, p. 241, Lima, 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **3**, 1943, p. 120.) An account is given of experiments in Peru on the effect on *Anomis texana*, Ril., and *Dysdercus ruficollis*, L., of adding selenium to the soil in which cotton is grown. Cotton seedlings were planted in plots containing soil to which sodium selenate was added at rates of approximately 5, 10, 20, 50, and 100 parts selenium per million. The plants that received the two highest dosages died prematurely, and those that received the third were stunted. The others grew normally. The plants of the three groups that survived were infested with larvæ of *Anomis* at the beginning of February, when flowering was beginning, and with nymphs and adults of *Dysdercus* in mid-March, when bolls were present. The percentage mortalities for the three treatments (5, 10, and 20 parts selenium) were 90, 100, and 100 in 13, 11, and 8 days for *Anomis* and 30, 73, and 37 in 13 days for *Dysdercus*. The larvæ of *Anomis* that survived pupated but the pupæ died. The surviving bugs gave rise to viable eggs. In further tests, neither species showed a preference for untreated over treated plants. When seeds from plants treated at the three rates were infested with nymphs and adults of *Dysdercus*, the percentage mortalities were 18, 70, and 82 in 15, 30, and 50 days for the lowest rate, 55, 90, and 100 in 15, 30, and 41 days for the next, and 65, 92, and 97 in 15, 30, and 50 days for the highest. No eggs were laid. It is concluded that the treatment is unsatisfactory against both species, for though the mortality of *Anomis* is high, the larvæ survive long enough to cause considerable damage.

384. Relation of Fertilizers to the Development of the Cotton Aphid. By R. L. McGarr. (*J. Econ. Ent.*, **35**, 4, 1942, p. 482. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 185.) Observations having indicated that the use of nitrogenous fertilizers or nitrogen-producing crops on land planted to cotton stimulates the development of *Aphis gossypii*, Glov., when calcium arsenate is used against other insects, an experiment was carried out in Mississippi in 1941, on land on which no fertilizer had been used in recent years, to obtain more definite information on the relation of nitrogen in the fertilizer to the abundance of the aphid. Infestations on cotton after treatment with fertilizers containing different amounts of nitrogen, but fairly constant amounts of phosphoric acid and potash, applied at the rate of 600 lb. per acre in April, just before planting, and with calcium arsenate dust, applied at the rate of about 6 lb. per acre at approximately 5-day intervals from the end of June, when the cotton was beginning to flower, were compared with those following calcium arsenate dust alone, fertilizer alone, and no treatment; six effective applications of calcium arsenate were made. Records made on the day before the first dust was applied and at approximately weekly intervals showed that aphid populations increased slowly in all plots for about a month and then very rapidly in the dusted plots, and that infestation by the boll weevil (*Anthonomus grandis*, Boh.) was significantly higher in undusted than in dusted plots. The nitrogenous fertilizer caused no appreciable increase in aphid populations when calcium arsenate was not used, but the increase caused by the latter was greater when fertilizers were used, the average number of aphids per square inch leaf surface for the four last examinations being 6·75, 8·34, 8·88, and 9·76 when the dust and fertilizers containing 0, 2·29, 4·08, and 6·53 per cent. nitrogen were used, 6·05 when the arsenate only was applied, 0·91 on untreated land, and 1·07 on land treated with fertilizer (6·53 per cent. nitrogen) only.

385. Notes on the Control of Cotton Aphids. By G. L. Smith *et al.* (*J. Econ. Ent.*, **35**, 4, 1942, p. 598. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 199.) Gives the results of preliminary tests made in Louisiana in 1941 to determine the effect of nicotine sulphate and free nicotine in different concentrations and with different carriers in controlling aphis on cotton. Dusts containing 3 per cent. nicotine (prepared by mixing 40 per cent. nicotine sulphate solution with lime or a 10 per cent. free nicotine dust with lime, clay or tobacco dust) applied on July 30 to a heavily infested field gave about 66 per cent. control 8 days after dusting in all cases but one (free nicotine and lime) in which a light dosage was used. Dusts containing free nicotine gave excellent control when applied on August 20 at the rate of 13·5-15 lb. per acre, but that containing nicotine sulphate applied at only 6·75 lb. per acre was less effective. In a third test the nicotine sulphate dust, applied on August 22, gave almost complete control in a heavily infested field in three days, and considerable reduction to the south of the dusted area, owing to drifting; the dust was more effective when applied when dew was forming than earlier when there was more drift.

386. Notes on the Effect of Arsenicals upon the Cotton Aphid, Predators, and Other Insects. By G. L. Smith *et al.* (*J. Econ. Ent.*, **35**, 4, 1942, p. 596. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 198.) Observations in cotton fields in Louisiana in 1941 showed that the cotton aphid was scarce and Coccinellids abundant in fields that had not been dusted for the control of boll weevil, while the aphid was very numerous in most of the dusted fields, and there were few Coccinellids after July 1. To find the effect of calcium arsenate dusts on these and other insects a field at least half a mile from any dusted one was given five effective applications of calcium arsenate containing 10 per cent. Paris green between July 23 and August 18, and one of two that were near dusted fields containing severe aphid infestations when the tests were begun was given three of a heavy calcium arsenate, containing a high percentage of water-soluble arsenic pentoxide, and clay (3 : 1) between August 5 and 16, while the other received four of calcium arsenate containing 1 per cent. free nicotine between August 4 and 18. Parts of each field were left untreated, and counts of the insect populations were made before dusting began and at weekly intervals throughout the experimental period. At the end of

the treatment the aphid population was three and four times as great in dusted as in undusted parts of the first two fields, but only slightly greater in the third. Considerably fewer Coccinellids and Chrysopid larvæ, but more boll weevils, were taken in dusted than in undusted areas, the reduction of Coccinellid larvæ being greater than that of the adults. The numbers of Capsids were reduced in the first field, possibly owing to natural migration, but probably to the Paris green. The fact that weevils were more numerous in the dusted parts of all fields was probably due to migration in search of food, since dense populations destroyed most of the food in undusted areas during August, whereas there was an increase of squares and blooms in the dusted areas during the early part of the experimental period.

387. Rotenone in Combination with Calcium Arsenate for Cotton Aphid Control. By C. F. Rainwater. (*J. Econ. Ent.*, **35**, 4, 1942, p. 500. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 188.) A discussion of the control of *Aphis gossypii*, Glov., and the increase in yield of seed cotton obtained under a wide variety of conditions in South Carolina, Georgia, Florida, Mississippi, Louisiana, and Texas, when ground derris root was added to calcium arsenate, applied against boll weevil, to give rotenone contents of 0·1-0·5 per cent. It was found that calcium arsenate with 0·5 per cent. rotenone was effective in keeping the aphid population at or below that in untreated plots, and caused a significant increase in yield over plots treated with calcium arsenate alone under conditions of heavy boll weevil injury. This mixture gave insignificantly greater increases in yield and fewer aphids than one of equal quantities of calcium arsenate and sulphur containing 0·25 per cent. rotenone, and usually significantly higher yields than calcium arsenate alone, whereas the other mixture did not. Smaller proportions of rotenone in either mixture were not very effective in preventing increase of aphids. Records obtained in Louisiana showed that cubé and timbo were as effective as derris as sources of rotenone, and those from South Carolina that diatomaceous earth, clay, pyrophyllite and walnut-shell flour were as effective as sulphur as diluents for calcium arsenate and rotenone. Where control of boll weevil was not a factor, the plots treated with the mixtures of calcium arsenate and rotenone were comparable with the untreated plots in both aphid population and yield, and where it was, these mixtures gave highly significant increases in yield over the control plots and significant increases over the calcium arsenate plots.

388. Effect of Boll Weevil and Cotton Aphid Control on Yield as Shown in a Factorial Experiment in 1941. By R. C. Gaines. (*J. Econ. Ent.*, **35**, 4, 1942, p. 493. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 187.) Factorial experiments to determine the comparative effect on infestation and yield of cotton of treatment with calcium arsenate dust for the control of boll weevil, and with nicotine against aphis, and a combination of the two treatments, were continued in South Carolina, Florida, Louisiana, and Texas in 1941. The nicotine was applied in a spray at the rate of about 2 lb. nicotine sulphate (40 per cent.) per 100 U.S. gals. water in Florida, and in a dust of tobacco and lime (9 : 1) to which the nicotine sulphate was added to give a nicotine content of approximately 3 per cent. in the other States. Comparison of the results from treatment with calcium arsenate or calcium arsenate and nicotine with those from no treatment or treatment with nicotine showed that the arsenate caused significant reductions in weevil infestation in all localities, significant increases in numbers of aphids in all localities except in Louisiana, and significant increases in yield in all except Florida and Louisiana, the increase in yield in Texas being partly due to the control of the bollworm (*Heliothis armigera*, Hb.). Similar comparisons showed that nicotine gave significant reductions in aphids, except in Louisiana, and significant increases in yield in Florida and Louisiana, and that calcium arsenate and nicotine interacted to cause significant reductions in aphids at all localities and a significant increase in yield in Louisiana. Calcium arsenate gave significant increases in yield over the control plots of 391, 64, and 45 per cent. in South Carolina and Louisiana, where weevil infestation was heavy, and Texas, where it was intermediate; nicotine gave non-significant increases in Florida, Louisiana, and Texas, and calcium arsenate and nicotine together gave

significant increases of 418, 128, and 41 per cent. in South Carolina, Louisiana and Texas, and increases that were not significant in another experiment in Louisiana and in Florida. Calcium arsenate and nicotine gave significant increases in yield over calcium arsenate alone of 78 and 39 per cent. in Florida and Louisiana and insignificant increases in South Carolina and in another experiment in Louisiana.

[*Cf.* Abstr. **151,** Vol. XX. of this Review.]

389. Calcium Arsenate with and without Aphicides for Control of Boll Weevil and Cotton Aphid. By M. T. Young *et al.* (*J. Econ. Ent.*, **35,** 4, 1942, p. 490. From *Rev. App. Ent.*, xxxi., Ser. A, **5,** 1943, p. 186.) In experiments against *Anthonomus grandis*, Boh. and *Aphis gossypii*, Glov., on cotton in Louisiana in 1941, undiluted calcium arsenate, zinc-safened calcium arsenate (3·4 per cent. zinc oxide, *p*H 10·5), mixtures of calcium arsenate and derris, cubé or timbo (0·5 per cent. rotenone) and calcium arsenate mixed with nicotine sulphate solution to give nicotine contents of 0·5, 1, and 2 per cent., or with a dust containing free nicotine to give 1 per cent. nicotine, were equally effective against the weevil, giving significant control. Calcium arsenate and zinc-safened calcium arsenate both caused significant increases in the numbers of aphids and resulted in no increase in yield over the control plots, but the mixtures of calcium arsenate with derris, cubé and timbo, which were equally effective, kept the aphid population at about that in untreated plots, and caused significant increases in yield when compared with calcium arsenate alone. Calcium arsenate and 1 per cent. nicotine from nicotine sulphate or free nicotine gave better control of aphids and higher yields than calcium arsenate with rotenone, and calcium arsenate with nicotine sulphate (1 per cent. nicotine) was more effective against the aphids than that containing free nicotine. A mixture of calcium arsenate and 0·5 per cent. nicotine applied in late afternoon gave better aphid control and a higher yield than a similar mixture or one of calcium arsenate and rotenone applied in the early morning. Alternate applications of calcium arsenate and a mixture of calcium arsenate and 2 per cent. nicotine gave much more effective control of aphids and higher yields than alternate applications of calcium arsenate and mixtures containing 1 or 0·5 per cent. nicotine.

390. Black-Headed Cricket in Baluchistan. By N. A. Janjua. (*Ind. Frmg.*, iii., **11,** 1942, p. 606.) The black-headed cricket (*Gryllulus domesticus*, Linn.), locally known as *tid*, is a pest of first importance in the Usta area (Sibi district). It appears in swarms at night and attacks cotton, *jowar*, oil-seeds, etc., and remains active from April to July. A 3-year scheme sanctioned by the Indian Central Cotton Committee was put into operation in April, 1942, and control work was organized in the area and on the bridges of the Khirtar Canal. Trenches and barriers were set up on the bridges to check the influx of the pest from the Kachli district of Kalat State, and control was also effected by means of a poison-bait consisting of rice bran, sodium fluosilicate, and molasses.

391. *Heliothis obsoleta* F. By F. Manolache. (*Viata agric.*, **31,** 1940, p. 355. In Rumanian. From *Rev. App. Ent.*, xxxi., Ser. A, **5,** 1943, p. 227.) *Heliothis armigera*, Hb. (*obsoleta* F.) is recorded from cotton, tomato, tobacco, and soy bean in Rumania, and a list is given of parasites of the eggs and larvæ.

392. An International Anti-Locust Campaign. By B. P. Uvarov. (*Nature*, 9/1/43, p. 51.) Details are given of practical schemes for the preventive control of the three species of African locust: the Red Locust (*Nomadacris septemfasciata*); Migratory Locust (*Locusta migratoria migratorioides*); and the Desert Locust (*Schistocerca gregaria*).

393. Some Results of Studies on the Desert Locust (*Schistocerca gregaria*, Forsk.) in India. By Y. Ramchandra Rao. (*Bull. Ent. Res.*, **33,** 4, 1942, p. 241. From *Rev. App. Ent.*, xxxi., Ser. A, **4,** 1943, p. 156.) This paper contains the most important of the results of the author's investigations on *Schistocerca gregaria*, Forsk., in India in 1931-39. The life cycle and migrations of phase *solitaria* were studied by means of regional surveys, in which all areas in which this phase occurs were visited at least once in every 2 or 3 months, and by intensive continuous observations throughout the year at selected spots. The surveys carried out over a period

of 9 years have shown that the bionomics of phase *solitaria* are strikingly correlated with seasonal weather changes. The annual cycle, characterized by migrations between areas with winter, spring, and summer rainfall, is described. Comparison of the annual cycle and migrations of phase *solitaria* with those of phase *gregaria* in 1926-31, which are briefly described, show that there is a remarkable parallelism between them. The discovery that phase *solitaria* can migrate over large distances, and that its population density in breeding areas is marked by continual fluctuations due not only to local breeding but also to immigration and emigration, has modified the original conception of the origin of outbreaks by the building up of large populations within given outbreak areas. Such building up is now visualized as the result of breeding under conditions favouring concentrations in one or more areas that may be widely separated but are connected by seasonal migrations, and the way in which outbreaks are thus built up in India is described.

394. *Orius insidiosus*, A PREDATOR ON COTTON INSECTS IN WESTERN TEXAS. By W. S. McGregor. (*J. Econ. Ent.*, **35**, 3, 1942, p. 454. From *Rev. App. Ent.*, xxxi., Ser. A, **3**, 1943, p. 113.) In western Texas, *Orius insidiosus*, Say, sometimes develops such large populations that it gives effective control of injurious insects, particularly those that attack cotton. During early June, 1938, large numbers of nymphs of this Anthocorid reduced infestation by nymphs of *Psallus seriatus*, Reut., in a cotton field from an average of 86 per 100 plants to 9 per 100 in 3 days, and in late July both nymphs and adults were observed preying on a heavy infestation of aphids, and on recently hatched larvæ of *Heliothis armigera*, Hb., that were feeding on the seed heads in an adjacent field of grain sorghum. When the sorghum was cut for silage shortly after, a severe outbreak of *Alabama argillacea*, Hb., was attacked by *Orius* nymphs, which destroyed over 90 per cent. of the pupæ and over 70 per cent. of the grown larvæ; as a result, infestation by the second generation of the moth was insignificant, though no control measures had been applied. In September, 1941, on cotton that was severely damaged by the first generation of *A. argillacea*, an average of 16 per cent. of the pupæ were dead, and a number of prepupæ were being attacked by *Orius*, which rendered control measures against the second generation unnecessary although the weather was favourable for reinfestation.

395. INDIA: REPORT OF THE IMPERIAL ENTOMOLOGIST. By H. S. Pruthi. (*Sci. Rpt. Agr. Res. Inst.*, New Delhi, 1940-41, p. 57.) Ecological work on the spotted bollworm of cotton (*Earias fabia*) and its parasite *Microbracon greeni* var. *lefroyi* was continued. Studies on the incidence of this pest and its parasite during the hottest and driest period of the year, May and June, indicated that the population of the bollworm was fairly high while the parasite was very rare. With the first showers of rain at the end of June and consequent fall in temperature and rise in relative humidity, the position was reversed—the incidence of the parasite began to rise and that of the host to decline.

In studies of fatal temperatures for the pink bollworm, an exposure of cottonseed for 24 hours to 45° C. was fatal to the larvæ when saturation deficiency of air was 3-14 mm. but not when the saturation deficiency was 32 mm. Mortality was higher among larvæ in American seed than in *desi* seed. Viability of cotton seed was not materially affected by exposure for about 20 minutes to 65° C. or 7 minnutes to 80°C

396. ÉTUDE DE L'ACARIOSE DU COTONNIER, CAUSÉE PAR *Hemitarsonemus latus* (BANKS) AU CONGO BELGE. By J. M. Vrydagh. (*Publ. Inst. Étude agron. Congo Belge*, Ser. Sci. No. 28, Yangambi, 1942. Price Fr. 20. From *Rev. App. Ent.*, xxxi., Ser. A, **7**, 1943, p. 297.) *Tarsonemus* (*Hemitarsonemus*) *latus*, Banks, all stages of which are described, was found on cotton in the Belgian Congo where it had not previously been recorded, in 1936, and observations in 1939 and 1941 showed that infestation was widespread in the northern savannah districts. It was also found infesting *Capsicum annuum*, rubber, castor, sweet potato, and other plants, and a list of its recorded food-plants is included. On cotton the mites live chiefly on the lower surfaces of the leaves and feed on the epidermis. Infested leaves curl, develop brown patches, and split, but do not drop prematurely. Infested cotton plants have unusually long internodes, develop few bolls, and are practically sterile. The injury

is similar to the leaf-curl of cotton recorded by Jones and Mason in Nigeria, and to that caused by *T. latus* and described by Hambleton in Brazil. The life-cycle lasted 4½ days in the laboratory at 24° C. (75·2° F.). The females oviposited on the lower surfaces of the leaves, beginning mostly 1-2 days after emergence, and deposited 6-33 eggs at the average rate of 3 a day. Pairing did not influence oviposition, but eggs laid by unfertilized females gave rise to males only. The process of pairing is described, and the significance of the habit of the males of transporting the nymphs is discussed. The mite is favoured by wet weather with abundant soil moisture and is rare during the dry season.

397. Termites in East Africa. IV. Termites and Buildings. By W. V. Harris. (*E. Afr. Agr. Jour.*, January, 1943, p. 146.) Describes the damage caused by Mound-building, Subterranean, and Dry-wood Termites to buildings, and the control measures recommended.

[*Cf.* Abstrs. **170, 415**, Vol. XVIII. of this Review.)

398. Ecological Relations of Plants with Ants and Termites. By J. C. T. Uphof. (*Bot. Rev.*, viii., **9**, 1942, p. 563. From *Rev. App. Mycol.*, xxii., **4**, 1943, p. 136.) Among the aspects included in this survey of the ecological relations of plants with ants and termites may be mentioned " the fungus-growing habit among ants and termites," " ant-fungi," and " termite-fungi." The bibliography of 193 titles comprises a number dealing with the mycological side of the symbiotic connection between fungi and insects.

399. The Nature and Extent of Damage Caused by *Bemisia gossypiperda*, M. and L. The White Fly of Cotton in the Punjab. By M. A. Husain and K. N. Trehan. (*Ind. J. Agr. Sci.*, xii., **6**, 1942, p. 793.) In the absence of any mechanical injury to the plant tissues, the effects of white-fly attack were studied in relation to the physiological changes in the plant, its rate of growth and its reproductive activities. The percentage of moisture is relatively higher in the uninfested plants with a corresponding increase of dry matter in the infested ones. Healthy plants show a lower C/N ratio—a condition that has been shown to stimulate the vegetative and reproductive growth of the plant. Nitrogen is higher in the foliage of the uninfested cotton plants till the middle of August, after which it may rise in the foliage of the infested plants. However, it is significantly higher in the bolls of the uninfested plants than in those of the infested ones. A much higher percentage of nitrogen, ash and fat is transported from the vegetative to the reproductive organs in the uninfested plants. Reduction of bolls on the infested plants may be the result of some dislocation in the carbohydrate and protein balance. The total dry matter produced by the uninfested plants as a result of their growth far exceeds that produced by the infested ones, and on an average may extend to about 40 per cent. Thus the vegetative and reproductive growths are superior in the case of uninfested plants. During the period of severe infestation the vegetative growth is checked and in severe cases of attack may be almost stopped. The boll formation increases as the intensity of attack decreases, while the shedding and bad opening of the bolls correspond with the increase in attack. The bolls produced by the uninfested plants are well developed and yield a maximum weight of *kapas*. The severity of infestation, particularly when it appears late in the growing season, lowers the yield of lint and affects the plant more adversely in all respects. *B. gossypiperda* has not been found responsible for the transmission of the " smalling " disease in cottons.

400. Some Factors Relating to Colonization, Recovery, and Establishment of Insect Parasites. By C. P. Clausen. (*Proc. 6th Pacif. Sci. Congr.*, 1939, **4**, Calif., 1940, p. 421. From *Rev. App. Ent.*, xxxi., Ser. A, **7**, 1943, p. 293.) The author discusses, with special reference to the development of method, some of the problems encountered in the course of work on the introduction of parasites and predators against insect pests. They include the question of whether stocks for liberation shall be imported or reared in the laboratory, and if the latter, the selection of suitable breeding hosts, the size and spacing of colonies, and the period for which attempts to establish a given species should be continued. Considerable influence is exerted on establishment by the conditions of light and temperature at the time of

release. Adults sometimes disperse widely and quickly when liberated in bright sunlight and at relatively high temperatures, thus reducing opportunities for mating among the individuals released and among their progeny and perhaps removing a large proportion of the colony from a small favourable area to others that are unfavourable. W. A. Baker has observed the immediate death of adults of certain parasites of the European corn borer (*Pyrausta nubilalis*, Hb.), notably *Macrocentrus gifuensis*, Ashm., when released under these conditions in the United States. This is attributed to physical shock, caused by the sudden transition from the moderate temperatures (45-60° F.) and diffused light or darkness in which the parasites are kept before release to temperatures often exceeding 100° F. and intense sunlight. Where species released under such conditions have survived and become established, it is probable that still more satisfactory results would be obtained if they were released under more favourable conditions. To overcome these difficulties it is suggested that releases should be made at dusk or at dawn, when activity would be reduced by the cool temperatures and dim light, and the tendency to disperse checked. Further advantages derived from liberations at dusk are the opportunity afforded by the night for the insects to recover from the effects of transport and to become accustomed to their new surroundings and for gradual adjustment to increasing light and temperature.

401. A Note on Technique for Routine Examinations of Parasitic Hymenopterous Larvæ. By G. C. Ullyett and J. S. van der Merwe. (*J. Ent. Soc. S. Afr.*, **5**, p. 147, Pretoria, 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 221.) In view of the importance in practical biological control of the routine identification of the larvæ of parasitic Hymenoptera, a simple and quick technique for the preparation of specimens for microscopic examination is essential. A description is given of a technique developed by the authors, and its advantages over other methods are discussed.

402. Methods of Rearing the Pink Bollworm Parasites *Chelonus* and *Microbracon*. By L. W. Noble and W. T. Hunt. (*J. Econ. Ent.*, **35**, 4, 1942, p. 597. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 199.) The authors discuss the difficulty of rearing introduced parasites of pink bollworm in the laboratory in Texas, largely owing to the short period during which the host is available. Studies of other possible hosts led to the selection of *Ephestia kuehniella*, Zell., which can be reared easily on dry food, and gives satisfactory results with most species of *Chelonus* and *Microbracon*; it has been used since 1935 for rearing bollworm parasites of these genera, with outstanding results in the case of *Chelonus*. For breeding *C. blackburni*, Cam., and *C. pectinophoræ*, Cushm., the eggs of *Ephestia* are obtained in large numbers by adaptations of earlier methods, scattered over a disk of moist absorbent paper pressed into a petri dish and exposed to the parasites in a cloth-covered cage for 24 hours. Although less satisfactory than pink bollworm (*Platyedra gossypiella*), *Ephestia* has been used for rearing *M. kirkpatricki*, Wlkn., *M. nigrorufum*, Cushm. and *M. mellitor*, Say. Since these Braconids will not oviposit in exposed larvæ, a method was developed by which the hosts were paralysed by immersion in hot water (7 minutes at 120° F. for *Platyedra*; 1 minute at 116° F. for *Ephestia*) and separated from the parasites by a cloth, but in view of the danger of killing the host larvæ, which would then decay before the parasite finished its development, this has been superseded by one in which the larvæ are confined between a heavy paper and a loosely woven cloth, bound in an embroidery hoop; all the parasite larvæ attach their cocoons to the paper, which is removed and cleaned of the remains of the hosts as soon as the cocoons are formed, to reduce the danger of infestation by mites.

403. Host List of the Parasitic Fungi of Uganda. Pt. 1. By C. G. Hansford. (*E. Afr. Agr. Jour.*, April, 1943, p. 248.) The host list published in 1937-38 contained a considerable number of fungi of which the names have now been revised in the light of more recent research and comparison with similar fungi in other parts of the world, with the result that that list is now out of date. Collection has been continued during the interval, and a considerable number of new records are included in the present list.

404. An Introduction to Industrial Mycology. By G. Smith. (Reviewed *J. Text. Inst.*, February, 1943, p. 41.) In the second edition of this useful book there would appear to be a reduction in size from 302 to 250 pages, but this is due to both sides of the paper being used in the printing of the 136 illustrations. The text has actually been expanded, notably by the inclusion of a separate chapter devoted to the yeasts. The only other major change is the provision of a new key to the classification of the large family of Hyphomycetales. References to work published since the first edition appeared include notes on the anti-bacterial substances produced by moulds, of which penicillin is one of the most important.

[*Cf.* Abstr. **304**, Vol. XVI. of this Review.]

405. List of Economic Plant Diseases in the Anglo-Egyptian Sudan. By A. S. Boughey. (*E. Afr. Agr. Jour.*, January, 1943, p. 188.) "This publication will be of particular interest to agriculturists in the Sudan, and is a useful addition to our information on plant disease distribution in Africa. Besides many agricultural and horticultural crops, some weeds and ornamentals which may serve as alternative hosts for crop diseases are also listed. The booklet is compact in size and is published by the Dept. of Agriculture and Forests, Khartoum, Sudan."

406. The Nature and Prevention of Plant Diseases. By K. S. Chester. (Blakiston Co., Philadelphia, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 202.) "The subject-matter of this book and the manner of treatment have been largely dictated by the needs of students to whom an elementary course in plant pathology is a part of the background fitting them for useful work in agriculture. . . . The book has the dual purpose of introducing the student to the essential features of the science, as exemplified in important diseases of our leading crops, and of providing him with a work to which he may refer for detailed and specific directions on plant disease control." Diseases of major importance to agriculture in the southern United States are given special attention.

407. Notes on Some Diseases of Field Crops, Vegetables and Fruits at the Imperial College of Tropical Agriculture. By R. E. D. Baker. (*Trop. Agr.*, March, 1943, p. 59.) The following cotton diseases may usually be found but not to any serious extent: *Glomerella* (*Colletotrichum*) *gossypii* (Anthracnose); *Bacterium malvacearum* (angular leafspot, blackarm); *Ramularia areola* (mildew); *Cerotelium* (*Kuehneola*) *gossypii* (rust); *Alternaria macrospora* (leafspot); *Nematospora gossypii* (internal boll disease); and root rots, usually caused by members of the genus *Rhizoctonia*, occur sporadically in wet weather.

408. Dissemination of Fungus Spores in Air. By P. H. Gregory. (*Trans. Brit. Mycol. Soc.*, xxv., **4**, 1942, p. 442. From *Rev. App. Mycol.*, xxii., **5**, 1943, p. 173.) Investigations on the air transmission of fungus pathogens to new areas are mostly concerned with how far and how high spores are transported by air currents. Comparatively little is recorded of the number of spores deposited within short distances. Under field conditions the relation between degree of infection and distance from an infected field may be important, and from the fact that printed observations on a number of diseases are in agreement with Stepanoff's formula it is thought that dissemination of spores in air may be measured quantitatively.

409. A New Culture Medium for the Growth of *Chætomium globosum*. By W. G. Chace and G. S. Urlaub. (*Amer. Dyestuff Rptr.*, **31**, 14, 1942, p. 331. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 287.) This investigation was directed toward developing a medium better suited to the growth of *C. globosum* than the Czapek agar in general use, in order that a large quantity of the spores might be available for the accepted testing of mildew-proofed fabrics. The medium finally developed used finely divided cellulose (mechanically disintegrated) as a source of carbon and KH_2PO_4 as a buffer. It is claimed for the proposed medium that (1) the time of sporing is cut to 4 or 5 days, (2) the quantity of spores produced is many times that obtainable on Czapek agar, (3) growth of common air-borne contaminants is greatly reduced if not entirely eliminated, and (4) the work of preparation of the medium is not much greater than with other culture media.

410. TEXTILE MILDEWS. By E. Hardy. (*Silk and Rayon*, xvi., **8**, 1942, p. 468. From *Rev. App. Mycol.*, xxii., **4**, 1943, p. 135.) Fresh samples of raw cotton are stated to have yielded from 4,000,000 to 58,000,000 bacteria and 120,000 to 400,000 moulds per gm., mostly of the soil types which attack cellulose and starch and survive the textile-manufacturing processes in the form of spores. Cotton deterioration in storage is caused by species of *Stachybotrys*, and raw cotton (especially Indian) is the source of much of this infection of cloth. The first sign of mildew is usually a characteristic musty smell, followed by the appearance of greenish, brownish, reddish, yellowish, purplish, or blackish spots due to the presence of *Penicillium chrysogenum*, *Aspergillus niger*, *A. versicolor*, *A. wentii*, *Fusarium* spp. and *Mucor* spp., respectively. Acidity stains are produced on dyed material by *A. fumigatus*, *A. niger*, *P. chrysogenum*, and *Rhizopus arrhizus*. Cellulose decomposing species responsible for tendering of cotton include the foregoing, *A. glaucus*, *A. versicolor*, and *A. terreus*, while *A. brunneofuscus*, *A. clavatus*, and *A. fumigatus* will attack the pure cellulose fibres of cotton under suitable moisture conditions and in the presence of inorganic salts. Well-washed wool requires an atmospheric humidity of 97 per cent. to encourage mildew, but a far lower concentration permits its growth in the case of an impure commercial product, while cotton is also susceptible—*e.g.*, to *A. glaucus*, at a point much farther removed from saturation. Most mildews thrive at 25° C., while *A. fumigatus* continues to grow at 37° C. The *Penicillium* and *Mucor* spp. generally flourish at lower temperatures than the *Aspergilli*, and are thus less prevalent on tropical material. Shirlan is stated to be the most efficient antiseptic at present known to the cotton industry. Some of the most effective of the 135 chemical treatments devised by the United States Dept. of Agriculture for the mildew-proofing of cotton fabrics are a cation (plus charge) active softener, followed by a synthetic resin, methyl methacrylate; acetone, formalin, and soda ash; wax and aluminium acetate; catechu copper sulphate and ammonium hydroxide; copper propionyl acetate; and cadmium chloride followed by borax. Sodium pentachlorphenate (santobrite) is an effective and cheap preventive of mildew, while of recent years successful use has also been made of non-toxic higher tertiary alkyl phenols—*e.g.*, abracide, which inhibited cellulose moulds at 1 in 6,000 and *M. mucedo* and *A. glaucus* at 1 in 4,000, and is supplied in a 5 per cent. solution made up in a 10 per cent. potash castor oil soap solution, used in conjunction with 10 per cent. ethylene glycol. The chemical changes produced by textile mildews are very far-reaching, *P. glaucum*, for instance, having been shown to secrete at least 12 enzymes which decompose the carbohydrates and proteids of the size and produce organic acids tending, in association with a powerful simultaneous reducing action, to destroy the coloured ground of printed goods. Under optimum conditions during manufacturing *Mucor* moulds may proceed from germination to fructification in 24 hours.

411. THE EFFECT OF COTTON SEED DUSTING ON EMERGENCE OF SEEDLINGS IN SOIL INFESTED WITH *Rhizoctonia*. By W. W. Ray. (*Phytopathology*, xxxiii., **1**, 1943, p. 51. From *Rev. App. Mycol.*, xxii., **6**, 1943, p. 205.) A tabulated account is given of a series of tests at the Oklahoma Agricultural Experiment Station in the control of *Rhizoctonia solani* on Deltapine cotton grown in heavily infested greenhouse soil, by seed-dusting with a number of chemicals. Emergence was substantially improved by treatment with new improved ceresan, Du Bay 1155-HH (ethyl mercury iodide), Du Bay 740-A (ethyl mercury borate), Du Bay 1228-R (methyl mercury naphthol sulphamide), and spergon, all applied at the rates of 3 gm. per kg. seed; but the differences in the subsequent survival of plants from the disinfected and control lots were not statistically significant, so that the practice of seed-dusting cannot be regarded as an effective means of combating post-emergence damping-off of cotton seedlings in soils containing an abundance of inoculum of *R. solani*.

412. COTTON ROOT-ROT CONTROL IN THE PUNJAB. By R. S. Vasudeva. (*Ind. Frmg.*, iii., **11**, 1942, p. 592.) A brief semi-popular account of the various experiments in the Punjab for the control of cotton root rot by mixed cropping.

413. COTTON ROOT-ROT STUDIES WITH SPECIAL REFERENCE TO SCLEROTIA, COVER CROPS, ROTATIONS, TILLAGE, SEEDING RATES, SOIL FUNGICIDES, AND EFFECTS ON

SEED QUALITY. By C. H. Rogers. (*Bull. No.* 614, Texas Agr. Exp. Sta., 1942.) Sclerotia, the resting bodies of the cotton root-rot fungus, have been found to a depth of 8 feet in the Blackland soils and in quantities of several million per acre in the first 3 or 4 feet of soil. The reductions in number of sclerotia following crop rotations and green manuring were scarcely large enough to explain the partial control of root rot obtained by these practices, suggesting that the beneficial effect may be on the active stage of the fungus in the soil or directly on the cotton plant. With the usual cotton-corn-oats rotation in which the oats were followed by summer catch-crops of cow peas and sorghum ploughed under for green manure in late summer, the yield of lint cotton in 1941 was greater by 100 lb. per acre in the plots receiving this treatment than in continuous-cotton plots, and the amount of root rot was 20-30 per cent. less. Similarly, in 1941, the yield from cotton following ploughed-under Hubam stubble (after harvesting for hay or seed) was twice as large as the yield from continuous-cotton plots, and root rot was reduced from 70 per cent. to 15-20 per cent. Early ploughing under of cotton stalks in 1940 resulted in a yield increase of 120 lb. seed cotton per acre in 1941, as compared with the usual late turning in of the stalks. Sesbania, guar, and certain selections of cowpeas showed resistance to root rot and may prove valuable in rotations designed for root-rot control and soil improvement. In a 3-year study, cotton seed was planted at rates of 2, 5, and 10 seeds per hill in hills 18 inches apart, and the stand was thinned to not more than 2 plants per hill at the time of chopping. The plots with the fewest seeds per hill had the least root rot at the end of the season. Subsoiling or tillage to depths of 15 inches or greater reduced root rot but no outstanding increase in yield was obtained. Treatment of the soil with certain fungicides, such as crude oil, was effective when applied sufficiently deep.

414. COTTON ROOT ROT, THE WEATHER, AND COTTON YIELDS. By W. N. Ezekiel. (*Trans. Tex. Acad. Sci.*, xxv, 1941, p. 63. From *Rev. App. Mycol.*, xxii., **4**, 1943, p. 135.) Many of the observations included in this survey of the relation of weather conditions to cotton root rot (*Phymatotrichum omnivorum*) have been previously discussed, but the author's interpretation of the final picture of the influence of rainfall on the host and parasite may be mentioned. Both respond in somewhat the same manner to this factor. Thus, in years of "favourable" rainfall comparatively high yields may be obtained even in areas where the disease is prevalent, but the output is very much lower than it would be in the absence of the fungus, the development of which is likewise promoted by continuous humidity. In other words, the root rot tends to equalize yields on the particular farms affected at drought level.

[*Cf.* Abstracts by same author in previous volumes of the Review.]

415. EXPERIMENTS TOWARD THE CONTROL OF TAKE-ALL DISEASE OF WHEAT AND THE *Phymatotrichum* ROOT ROT OF COTTON. By F. E. Clark. (*Tech. Bull. U.S. Dept. Agr.*, 835, 1942. From *Rev. App. Mycol.*, xxii., **4**, 1943, p. 129.) In connection with root rot of cotton, uncontaminated, viable sclerotia of *Phymatotrichum omnivorum*, the agent of cotton root rot, survived as well in sterile, organic-amended, as in sterile, untreated soil, suggesting that the destruction of these organs is effected by the saprophytic microflora. Widely differing types of organic material, including starch, cellulose, ground wheat straw, ground lucerne hay, crimson clover and hairy vetch tops, and commercial peptone, were successfully used at rates of 0·5 to 5 per cent. for the extermination of the sclerotia from both Hunt clay and Wilson loam soils given either the high- or low-nitrogen type of amendment; the incidence of elimination from washed sand was slightly poorer. In tests to determine the influence of the incubation temperature and soil moisture on the efficacy of the organic substances against *P. omnivorum*, 12, 30, 72, and 91 per cent., respectively, of the viable sclerotia were destroyed at 2°, 12°, 28°, and 35° C., respectively, and 59·5, 66·2, 76·7 per cent., respectively, at 35, 38, and 80 per cent. of the moisture-holding capacity of amended Hunt clay, the corresponding percentages for unamended soil being 37, 38, and 33. Cutting healthy cotton roots below the crown was found to hasten their colonization by saprophytic fungi, no such effect following the infliction of injuries above the crown. From plants parasitized by *P. omnivorum* but not

mechanically injured, *Penicillium* and *Trichoderma* spp., Dematiaceæ, and sterile mycelia were encountered with greater, and *Aspergillus* spp. and Mucorales with less, relative frequency on root segments incubated in the moist chamber. About two-thirds of all the root segments recovered from healthy, unwounded plants were free from saprophytic fungi, which developed, however, on four-fifths of those clipped below the crown; at the same time, this practice contributed to the rapid disappearance of the root-rot organism from its host.

416. Tap-Root Damage of Cotton, Ascribed to Termites, in the Sudan Gezira. See Abstr. **293** of this issue.

417. Studies in the Periodic Failures of the Punjab-American Cottons in the Punjab. VII. Amelioration of *Tirak* on Soils with Saline Subsoils. By R. H. Dastur and M. Singh. (*Ind. J. Agr. Sci.*, xii., **5**, 1942, p. 679.) *Tirak* or bad opening of bolls in the Punjab-American cottons on soils with saline subsoils is mainly caused by a disturbance in the water balance of the plant. A water deficit arises in the plants toward the fruiting stage, which is the most critical period of plant life, and becomes more pronounced as time goes on. Salinity in the subsoil renders the absorption of water difficult and the plants succumb to the physiological drought. Replicated field experiments were conducted to study the effects of the following three types of ameliorative measures during the cotton seasons of 1938-39 to 1940-41 on such lands where subsoil salinity was known to exist and where *tirak* had previously occurred: (1) applications of gypsum, silt, farmyard manure and green manures, (2) washing down of the salts from the feeding zones of the roots by flooding of such lands, and (3) preventing the development of a water deficit by means of late sowings or by giving extra applications of water at the fruiting stage. No success was achieved with the first two measures, but the third—deferred sowings and extra applications of water from the flowering stage—proved successful in remedying *tirak*.

[*Cf.* Abstrs. **724**, Vol. XVI, **238**, Vol. XIX, **17**, Vol. XX.]

418. El Verticillium-Wilt del Algodonero. By T. Boza Barducci and G. C. Rada. (*Bol. Estac. Exp. Agr. La Molina* 23, Lima, Peru, 1942. From *Rev. App. Mycol.*, xxii., **5**, 1943, p. 166.) The species of *Verticillium* responsible for cotton wilt in Peru has been determined as *V. albo-atrum*, the optimum temperature and hydrogen-ion concentration for which in cultures on Czapek's, potato dextrose, and potato peptone dextrose agars were found to be 22° C. and *p*H7, respectively. The pathogen, which produces a systemic disease in its host, may easily be isolated from fresh material, the tips of the plant and of the branches and the secondary rootlets yielding the maximum percentages of fungal colonies (43·7, 59·5, and 43·4, respectively, compared with 34·3, 26, and 6·2 for the petioles, boll peduncles, and tap root, respectively).

419. Soil Moisture and Wilt Disease. (*Nature*, 24/6/43, p. 107.) In the Niagara Peninsula in 1940 wilts due to *Verticillium albo-atrum* R. and B occurred on a number of hosts, and Colin D. McKeen reports in the *Canadian J. Res.*, March, 1943, the results of an extended series of investigations designed to ascertain the factors leading to such epidemic outbreaks, which occur only occasionally in the Peninsula. It is found that there is a very definite optimum temperature for the development of the pathogen in the soil and that an outbreak of disease is only to be expected when such soil temperatures coincide with the presence of relatively high values of soil moisture. This only occurs rarely in this locality, which thus usually escapes serious injury from *Verticillium* wilt, because of the low soil moisture throughout that part of the growing period during which soil temperatures favour the growth of the fungus.

GENERAL BOTANY, BREEDING, ETC.

420. The Material Basis of Evolution. By R. Goldschmidt. (Oxf. Univ. Press, 1940. 30s. Reviewed *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 171.) This book presents an elaboration of the material contained in the eight Silliman Lectures delivered by the author in December, 1939. It is commended to the attention of all geneticists and indeed all who are in any way concerned with the science or practice of breeding.

whether of animals or plants. Many voices have been raised, especially in the last few years, against the views of the classical geneticists and neo-Darwinians, but few, if any, have the backing of such a body of experimental data and the authority of such a wealth of experience as that with which Richard Goldschmidt presents his case. The author discusses firstly micro-evolution which, he concludes, proceeds within the species by the accumulation of small mutations. These, however, never lead to the formation of incipient species or higher categories, which originate by single macro-evolutionary steps. A great weight of evidence is presented to show how a single change—*e.g.*, one affecting the early embryonic processes—may affect the entire organism in just such a way as is characteristic for the differences between species, genera or higher orders. The changes in question often involve a difference in velocity of some process—*e.g.*, a catalytic reaction—and have been well studied by many animal geneticists and physiologists; unfortunately, the plant kingdom remains largely an unexplored field in this respect, and this may be the reason why the neo-Darwinian principles of speciation by selection and accumulation of unit differences are so slow to be uprooted. The rôle of selection is of course not denied; we read: "The formation of a rassenkreis of sub-species (including the still lower categories) is the method by which a species adapts itself to different local conditions within the area which it is able to inhabit. This adaptation, strictly within the limits of the species, is produced by micromutation in different directions, involving all known types of Mendelian inheritance of manifold morphological and physiological traits. Selection by pre-adaptational combinations accounts for everything else." The differences between true species, however, constitute something more profound, and are on a different genetic level, involving differences in reaction systems, instincts, etc., and there is a bridgeless gap between them. Chromosome rearrangement is one of the suggested ways in which the major change producing species differences may be brought about. "More and more facts are accumulating which show that the intimate serial pattern of the chromosome is important for the action of the hereditary material." Chromosome breaks which lead to new serial arrangements may produce definite genetic effects which are not different from the typical effects of mutations. The effect of regrouping the components of a chromosome are compared with that of regrouping the components of many known chemical compounds—*e.g.*, the male sex hormone, which has certain stereoisomeres that are without any effect at all; changes of this kind can produce systemic mutations, not involving the creation of anything new but sometimes entailing immense phenotypic changes of a macro-evolutional order. It will be seen that all this may come about without the intervention of the gene as such, and the classical atomistic theory of the gene is not indispensable, it is found, either for genetics or evolution. Such a view of evolution, arrived at from a study of the animal kingdom, is in striking consonance with those arrived at by careful studies of floral evolution by such careful observers as Willis and Guppy; it has the advantage of verisimilitude, in that a systemic mutation of the kind described leads at once so far toward the new type that selection can immediately be efficacious. The various improbable assumptions of the neo-Darwinians to explain the survival of the intermediate steps are thus no longer necessary. A change identical with many known mutations can often be produced also by purely environmental means such as alterations of temperature, hormones, or other agencies which affect the velocity of reactions; these effects are known as phenocopies and provide a powerful example of how a complex macro-evolutionary change can be produced by an exceedingly simple mechanism.

421. Evolution in Plants by Kaleidoscopic Mutation. By J. C. Willis. (*Proc. Roy. Soc., Ser. B*, **131**, 1942, p. 161. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 106.) The theory is elaborated that evolution proceeds from the family, through genus to species. The endemic type is shown to be the young form and not a refugee, and the mutating ancestor must be assumed to possess all the contrasting characters though they are not all shown, hence the analogy with a kaleidoscope.

422. Regeneration, Development and Genotype. By C. E. Allen. (*Amer. Nat.*, **76**, 1942, p. 227. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 210.) In this paper, one

from a symposium on "Growth and Differentiation in Plants," the author discusses the genotype, its potentialities and limitations in regeneration and development. While the germ cell can reproduce the complete genotype, somatic cells vary considerably in their capacity to reproduce even cells like themselves. A review of some of the outstanding facts of regeneration, from the formation of the complete genotype from one somatic cell to cells incapable of division, leads to the suggestion that the cytoplasm may play an important part in determining the capacity of the nucleus.

423. TAXONOMY AND PHYLOGENY. By W. B. Turrill. (*Bot. Rev.*, **8**, 1942, pp. 247, 473. From *Pl. Bre. Abs.*, xiii., **1-2**, 1943, pp. 24, 122.) In Pt. I, the principal advances in taxonomy are stated to be due, among other factors, to the inclusion of results from modern advances in the study of genetics and cytology. Pt. II. deals very fully with two main aspects of the problem of the relation between taxonomy and phylogeny, namely: (1) taxonomic and phylogenic concepts and criteria, and (2) data used in classification and phylogenetic studies; the latter section includes special sub-sections dealing with the cytological and the genetical contributions. In discussing the value of ecological and phytogeographical data, the author expresses the view that "though phytogeography has much light to throw on phylogeny and much help to give taxonomy . . . full and careful analysis is essential before synthesis." Pt. III. deals with classification and phylogeny in major plant groups; logical as opposed to phylogenetic classification; phylogenetic diagrams and the summing up. In the final discussion of this comprehensive and suggestive review the writer pleads for the use of more inductive methods in phylogenetic investigation (especially in the angiosperms). He also considers the main question of how far a known phylogeny can be incorporated in an improved classification, and further points out the limitation that should be imposed in the use of phylogeny in a general classification. In conclusion, the increasing difficulty of fitting the results of modern studies in autecology and genetics into the existing scheme of taxonomic nomenclature is indicated, and this fact and its relevance to phylogenetic research too is recommended to the urgent attention of biologists.

424. THE RELATIONSHIP OF AGRICULTURAL SCIENCE WITH TAXONOMY AND CYTOLOGY. By W. Burns and B. P. Pal. (*Roy. Bot. Gdn., Calcutta*, 1942, **150**, 23-1—23-6. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 178.) The authors review the work on the geographical distribution, genetical behaviour, and chromosome numbers of cotton, sugar-cane, and rice; they also give the general concepts of the classification, origin, and evolution of the above genera and their species, which have been deduced from the work under review. Mention is made of the classification of cotton and rice prepared by two sub-committees of the Imperial Council of Agricultural Research in collaboration with the Indian Central Cotton Committee.

425. DIVISION OF PLANT BIOLOGY. By H. A. Spoehr *et al.* (*Carnegie Inst. Washington, Yearbk.*, **40**, 1940-41. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 485.) Progress reports are included on the results of fundamental investigations of photosynthesis said to be of such significance that virtually all hypotheses thus far advanced to account for its mechanism must be abandoned or drastically revised; on experimental taxonomy approached from the morphologic, geographic-ecologic, genetic, and cytological standpoints; studies of the conditions determining the types of vegetation found growing naturally in uncultivated areas; and paleobotanical investigations as providing an historical viewpoint for botany. The more detailed reports cover: "Biochemical Investigations" (Spoehr *et al.*), including studies of the organic nutrition of plants, use of radioactive CO_2 in photosynthesis, the state of pigments in leaves, isomerization of carotenoid pigments and olefinic fatty acids, and oxidation-reduction reactions in leaves; "The Quantum Efficiency of Photosynthesis" (R. Emerson and C. M. Lewis); "Ecology," including adaptation and origin (F. E. Clements *et al.*), and climate, climax, and conservation (F. E. and E. S. Clements); "Paleobotany" (R. W. Chaney).

426. CERTAIN PHYSICAL PROCESSES AND THE PRODUCTION OF GENE MUTATIONS BY IRRADIATION. By K. G. Zimmer and N. W. Timofeeff-Ressovsky. (*Z. indukt. Abstamm.- u. Vererb. Lehre*, **80**, 1942, p. 353. In German. From *Pl. Bre. Abs.*, xiii., **2**,

1943, p. 121.) The use of very dense ionizations produced by neutrons led to a reduction in the mutation rate, once more suggesting the existence of a sphere of action (Treffbereich) of finite dimensions, within which a second hit produces no further effect. The size of this sphere of action has been calculated theoretically as of the order of magnitude of 1,000 atoms, which agrees well with that found in practice, assuming that a single mutation is produced by a single ionization and not by a group of ions. The results can be interpreted satisfactorily without assuming the transference of energy indirectly by activated molecules, and the authors find no reason to alter their earlier views on the mutation process.

427. INDORE INSTITUTE OF PLANT INDUSTRY: RESEARCH WORK, 1941-42. A progress report of the work carried out in connection with the following:

1. *Genetics.*—(*a*) Study of the major factors in *Gossypium arboreum* and *G. hirsutum* cottons: leaf shape; anthocyanin; lintlessness; fuzziness and X-ray variations. (*b*) Wilt resistance in *G. arboreum* cottons. (*c*) Study of the potentialities of different ecotypes with regard to combination of economic characters. (*d*) Genetics of quantitative characters.

2. *Cytology.*—(*a*) Study of the colchicine effect on hybrids and wild cottons. (*b*) Chromosome morphology of inter-*arboreum* hybrids.

3. *Physiology.*—(*a*) Investigations into simple methods of fibre weight determination in earlier stages of plant-breeding work. (*b*) Study of competition effects between *desi* and selected Upland cottons in a mixed crop (final trial). (*c*) Study of the survival of Upland and *desi* cotton in a mixture. (*d*) Factors which give rise to undeveloped ovules and immature fibres in different cottons. (*e*) Simple experiments on germination in cotton and on relationship of size of seed to plant vigour.

4. *Statistics.*—(*a*) Effect of selection on genetic variance in cross progenies. (*b*) Application of discriminant function in cotton breeding. (*c*) Statistical analysis of existing data.

428. POLYGENIC INHERITANCE AND NATURAL SELECTION. By K. Mather. (*Biol. Rev.*, **18**, 1943, p. 32. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 105.) The author expounds the principle of multiple genes and explains certain ways in which their behaviour differs from simple genes. One of these is the manner in which potential variability may be freed by segregation and thus provide the material for selection; with polygenes the process becomes very complicated and very close adjustments are possible, while maintaining the balance between fitness and variability. This potential variability, released by recombination, provides an explanation for the great and prolonged changes that can be brought about in plants and animals under the influence of selection. The rate at which the potential variability is released is controlled not only by the recombination frequency, but by the arrangement of the polygenes in the chromosome. Heterosis is regarded as an expression of lack of balance resulting from selection and hence is seldom to be found in wild populations. The variability produced by mutation is in the case of polygenes mostly potential and is only gradually released to be acted upon by selection. The breeding system is an adaptive character, inbreeding leading to immediate fitness but lack of flexibility, outbreeding to the reverse. The author regards polygenes as the main mechanism even in such operations as heterogeneous breeding systems (pin and thrum, etc.) or sex separation, which are operated by "switch" genes. In this he represents a viewpoint distinct from that of Goldschmidt, who regards the polygenes as secondary and the "switch" mechanism as the fundamental.

429. POLYGENES AND OLIGOGENES. By C. H. Waddington. (*Nature*, **151**, 1943 p. 394. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 180.) It is pointed out that no true distinction can be made between polygenes and oligogenes such as is attempted by Mather; in fact a single gene may be polygenic with respect to one character and oligogenic with respect to another. It is suggested that these terms should be discarded or used only with qualifications.

430. COLD SPRING HARBOUR SYMPOSIA ON QUANTITATIVE BIOLOGY. Vol. X. THE RELATION OF HORMONES TO DEVELOPMENT. (Biol. Lab., Cold Spring Harbour,

L.I., New York, 1942. Reviewed *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 273.) The Cold Spring Harbour Symposia have justly earned a high reputation for bringing together in a constructive way contributions which, though based on widely different experimental material and techniques, yet bear on some common feature of fundamental importance in biology. The 1942 Symposium gives an invaluable survey of our present knowledge of the rôle of hormones in the development of plants and animals of higher and lower orders. In terms of the rate of advance of biological science it is now a long time since the notion was clearly advanced and widely accepted, that the working of genes would have to be explained in terms of substances of high physiological activity, operating at low concentrations. In the sense that no single gene has yet had its operations explained in purely chemical or biochemical terms, there is still much ground to be covered before the effects of genes in the life history of the individual are as well understood as their passage from generation to generation. But the papers given at this symposium show that at least some of the main routes across this new country are being mapped. Much of the work reported is physiological rather than genetical, providing the basic knowledge which will later be used as a guide in investigating genetic differences. The work on animals, especially mammals, having a longer history, is more detailed and generally more advanced than on plants. The reader, however, who has been out of touch with work on plant hormones and development for two or three years will be amazed at the leaps forward which have been made. New groups of physiologically active substances have been discovered having formative effects on leaves, as well as affecting cell enlargement. The development of embryos *in vitrio* can now be controlled with considerable exactness, and the development towards flowering of short-day plants can be analysed in terms of the production of precursors of a, as yet hypothetical, flower-producing hormone. The book is well worth studying for the new ideas set forth, for the new techniques described, and also for the discussions reported after each paper. It is illustrated by line drawings and half-tone plates, and an index is provided.

431. Some Czechoslovak Contributions to Genetics (1866-1938). By Dr. G. Druce. (*Nature*, 1/5/43, p. 495.) Discusses the work of Gregor Mendel and that of Dr. Arthur Brozek, the first professor of genetics in the Charles University of Prague. Notes are also included of the work of Professors Bilek, Krizenecky, Matiegka, Helfort, and others.

432. Production Genetics in Sweden. By C. D. Darlington. (*Nature*, 13/2/43, p. 183.) During a recent visit to Sweden the author had the opportunity of seeing the important breeding work that is being carried out by that country. The organization of the plant-breeding work at the Svalov stations is described, together with the use of modern methods of plant breeding, more particularly the value of colchicine in the production of polyploids. The co-ordination of the work of the various research institutes and universities with a national policy is held to be of primary importance.

433. Genetics of Petal Colour in Asiatic Cottons. By B. Nath. (*Ind. J. Genet. Pl. Breed*, **2**, 1942, p. 43. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 111.) "It is shown that 2 factors, *Ya* and *Yb*, are necessary for the production of yellow petal in Asiatic cottons. *Yb* is shown to assort independently of the gene R_2."

434. The Chromosomes. By M. J. D. White. (Methuen and Co., Ltd., London, 1942. Price 5s., 2nd edn. Reviewed *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 172.) The second edition differs from the first in that a short section on the chemical composition of chromosomes has been incorporated in Chapter II, and the final chapter, on chromosomes and evolution, has been rewritten.

[*Cf.* Abstr. **372**, Vol. XV. of this Review.]

435. Induced Chromosomal Changes and their Significance in Growth and Development. By J. M. Beal. (*Amer. Nat.*, **76**, 1942, p. 239. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 212.) Reviews the various ways by which chromosomal changes may be induced, including X-rays, temperature changes, various chemicals and polyploidy, and discusses briefly their value to the plant—in the part they play in species formation.

436. CHROMATIN BRIDGES IN COTTON. By N. K. Iyengar. (*Ind. J. Agr. Sci.*, xii., **5**, 1942, p. 785.) Chromatin bridges were noticed at anaphase I, metaphase II, and anaphase II of meiosis in F_1 triploid hybrids between Asiatic and American cottons. The number of such bridges at metaphase II varied from one to four per nucleus, indicating that structural changes had taken place in more than one bivalent. In the hybrids examined no abnormal configurations at metaphase I, as unequal bivalents, etc., could be clearly observed. The bridges at metaphase II were long and thin and their persistence at this stage indicated that the bridges formed at anaphase I were not broken. The formation of a bridge at anaphase II in one of the sister cells indicated that a loop chromatid must have been formed at anaphase I as a result of an inversion pairing and two cross-overs having taken place, one in the inversion region and one in the region proximal to it, in which only one chromatid was involved in both the cross-overs. A monocentric loop and a fragment would be formed at anaphase I. The loop chromatid formed a bridge at anaphase II, the centromere having divided. These results indicate that in the triploids under study both numerical and structural changes take place. Both of these factors may contribute to the sterility of the hybrids. The structural changes lead to the formation of new chromosomes which may prove to be of evolutionary significance.

437. RECENT WORK ON GERMINATION. By M. A. H. Tincker. (*Proc. of Linn. Soc. of Lond., Session* 154, 1941-42, Pt. 2, 19/2/43.) A review of recent literature on the subject given under the headings of: Longevity and Storage Conditions; Hard Seeds; After-ripening and Stratification; Epicotyl Dormancy; Alternating temperatures; Grasses; Light; Oxygen; Size and Maturity of Embryo; Examples of Chemical Stimulation and Inhibition; Growth Substances; Fungal Invasion; Soil and High Temperature; Miscellaneous; Seed Germination and Lunar Phases; Rapid Methods of Determining Viability; Cytology and Dormancy; Seed Treatment and Aftergrowth.

438. PASSAGE OF AIR THROUGH PLANTS AND ITS RELATION TO MEASUREMENT OF RESPIRATION AND ASSIMILATION. By V. F. C. Glasstone. (*Amer. J. Bot.*, **29**, 2, 1942, p. 156. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 492.) Examination of 17 plant species indicated the passage of air through their tissues both in the direction of leaf to root and the reverse. There was an approximate proportionality between the amount passing and the applied pressure, and the results were reproducible. Age, size, and moisture condition of the plant were factors apparently affecting the rate of passage. It is suggested that although individual and specific differences occurred in the ability to allow air passage, those differences are believed to be matters of degree only. The rapid passage of air through plants was demonstrated in connection with measurement of CO_2 produced in respiration.

439. THEORIES OF BREEDING AND THEIR APPLICATIONS. By M. Yamazaki. (*Bot. and Zool.*, **6**, 1938, p. 106. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 121.) The writer formulates his views on plant breeding and genetics under various heads, including the technique of propagation (regulation and acceleration of flowering), pollen storage, sterility, interspecific hybridization, induced mutation, parthenogenesis, resistance to disease, drought and cold, techniques (including micro-cultures in the study of ecological characteristics) and chromosome numbers as a means of identification of varieties.

440. A NEW METHOD OF PLANT BREEDING. By J. W. Boyes. (*Pr. Bull. Univ. Alberta*, 1941, **26**, p. 5. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 106.) Describes the use of colchicine in producing new forms of economic plants: chromosome doubling in tobacco has increased nicotine content 50 per cent., tetraploid tomatoes have more vitamin C than diploids, and cotton plants longer and stronger fibres. A more important use of colchicine is the restoration of fertility by chromosome doubling in sterile hybrids between different species and genera.

441. RECENT ADVANCES IN PLANT BREEDING WITH SPECIAL REFERENCE TO THE WORK OF THE IMPERIAL AGRICULTURAL RESEARCH INSTITUTE. By B. P. Pal and S. Ramanujam. (*Roy. Bot. Gdn. Calcutta*, 1942, 150, 24-1—24-10. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 178.) In the section of this paper dealing with advances made in plant breeding in countries other than India, the authors review the results

obtained from studies on single plant selection and hybridization, hybrid vigour, the search for new genes, wide crosses, artificial induction of mutation, genetics of physiological characters, vernalization, and plant hormones.

442. How Plant-Breeding Programmes Complicate Plant-Disease Problems. By N. E. Stevens. (*Sci.*, **95**, 2465, 1942, p. 313. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 527.) This is a general, critical discussion of the problems involved with specific examples including wheat and hybrid corn. In addition to the two well-recognized methods by which the incidence of losses from diseases and insect pests is strongly influenced—viz., weather changes and introduction—a third, the work of plant breeders, is added. Furthermore, two closely related results of breeding programmes are the introduction on a commercial scale of varieties very susceptible to certain, sometimes new, diseases and the modifying effects of new varieties on parasites long known to be commercially important. The number of potential pests is so great and the conditions so complex that no practical tests for disease resistance can cover all possible situations, so " the real test of a new variety is its culture in the hands of ten to twenty thousand farmers."

443. Breeding Disease-Resistant Crops. By F. N. Briggs. (*Science*, **96**, 2481, 1942, p. 60. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 203.) Referring to a recent paper by Stevens attention is called to the method of backcrossing for avoidance of the danger of introducing genes for susceptibility to one or more diseases when breeding for resistance to another.

[*Cf.* previous abstract.]

444. Influence of the Environment on the Expression of Hereditary Factors in Relation to Plant Breeding. By S. H. Yarnell. (*Proc. Amer. Soc. Hort. Sci.*, **41**, 1942, p. 398. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 210.) The author reviews the work of many investigators who have shown the effect of the environmental factors moisture, temperature, light, nutrition, and many geographic and cultural conditions, on Mendelian factors. It has been shown that appropriate environmental conditions must be present before any gene or gene combinations can have a selective value, either natural or in plant breeding, and that genes of value in one area may be lost by breeding elsewhere. Improvement might be expected in some cases by intervarietal crosses, by accumulating genes from different varieties that may have a favourable effect directly or in combination, and in other cases by out-crossing to available wild forms or making wide crosses among cultivated forms.

445. The Chemical Composition of the Cotton Plant and the Uptake of Nutrients at Different Stages of Growth. By L. C. Olson and R. P. Bledsoe. (*Ga. Sta. Bull.*, **222**, 1942. From *Exp. Sta. Rec.*, **88**, 6, June, 1943, p. 760.) The time and rate of absorption of plant foods by cotton were studied, 1939-40, under field conditions on fertilized Cecil and Tifton sandy loams and Clarksville gravelly loam. These soils are acid and low in base-exchange capacities, organic matter, and mineral nutrients. Dry weight on Cecil soil (producing 2,000 lb. of seed cotton) averaged 9,720 lb. per acre, Tifton (495 lb. seed cotton) 6,176 lb., and Clarksville (807 lb. seed cotton) 5,401 lb. The quantity of nutrients (N, P_2O_5, K_2O, CaO, and MgO) absorbed from the three soils totalled 538, 393, and 311 lb. respectively. On the Cecil and Tifton soils the heaviest uptake of nutrients occurred from early-boll formation to maturity, while on Clarksville soil more was taken up during the early-square to early-boll stage. On Cecil soil absorption of nutrients was greatest 105 days after planting, when boll formation was rapid. At 120 days or longer after planting dry weight production and nutrient absorption were largely confined to the bolls. Some translocation of nutrients from plants to bolls occurred at the late growth stages. The amount of nutrients found in the cotton plant exceeded that ordinarily added in fertilizer mixtures, indicating the importance of plant residues in maintaining the fertility of cotton soils. The average amounts of nutrients found in the mature plants for all three soils approximated: N 104 lb., P_2O_5 38, K_2O 97, CaO 132, and MgO 43 lb.

446. Cotton Plant: Development and Yield; Influence of Mineral Elements. By A. A. Kuz'menko *et al.* (*Compt. rend. acad. sci., U.S.S.R.*, 1941, **31**, p. 273.

From *Summ. Curr. Lit.*, xxiii., **10**, 1943, p. 265.) Various compositions of nutrient were tested at different periods of plant growth. The highest need for nutrients is the time when the plant has formed 3-4 leaves. The maximum yield of raw cotton is obtained when N : P : K in Hellriegel's solution is 1 : 4 : 1 before flowering and 4 : 1 : 4 after flowering, or 4 : 4 : 4 before flowering and subsequently reduced to 1 : 1 : 1 or ¼ : ¼ : ¼. Tests were also conducted in soil cultures, details of which are given. The experiments aimed at reducing the growing period.

447. Results from Inbreeding Upland Cotton for a Ten-Year Period. By H. B. Brown. (*J. Amer. Soc. Agron.*, **34**, 1942, p. 1084. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 241.) Although many plants are injured by inbreeding, some varieties of cotton and other plants have been reported as being unchanged. The characters on which inbreeding might have an effect are given as seed germination, vegetative growth, number of blooms, boll size, earliness as shown by bold opening, staple length, lint percentage, and weight of cotton seed. Over a 10-year period there was an average reduction of 6·2 per cent. in blooming rate, a 9·3 per cent. reduction in boll size, and a 9·3 per cent. reduction in production of seed cotton. The other characters did not show changes of any significance.

448. Hybridization Between Cultivated Asiatic and Cultivated American Cotton Species: A Review. By N. Yamada. (*Jap. J. Genet.*, **16**, 1940, p. 79. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 147.) The work of numerous investigators is reviewed, special attention being directed to the fertility of the hybrids. In connection with Tanaka's findings on the use of wiring and ringing in interspecific crossing, the writer points to an instance showing that when an Asiatic species was used as the female parent, with wiring and peeling treatments, no seeds were set.

[*Cf.* Abstr. **151**, Vol. XV. of this Review.]

449. Grafting Experiments with Cotton. By S. G. Stephens. (*Trop. Agr.*, February, 1943, p. 33.) A major difficulty in carrying out experimental work with cotton in a humid climate is the storage of seed. In Trinidad it has been found more satisfactory to maintain all material, other than that required for immediate genetic study, by grafting. In 1939 two experiments were carried out to test the relative suitabilities of various types as stocks. One experiment was designed on a field scale for the purpose of comparing growth rates, earliness of flowering, types of bolling curve, and yields of selected scions on a range of stocks. The scions used were St. Vincent Sea Island (V135), American Upland (Triumph) and P3494s, and the stocks St. Vincent Sea Island (V135), Jamaica Long Staple (J.L.S.), American Upland (Triumph), Gambia 4V, and N.14. The second experiment was carried out on a small scale and was designed to measure the mutual interaction of stock and scion in two varieties, Triumph and V135, as shown by rate of growth of scion and rootstock. In both experiments the method of grafting employed was the "approach" or "bottle"-graft (Harland, 1927). The results are shown in various tables and graphs, and are discussed. It is suggested that the stock becomes adjusted to the requirements of the scion. No permanent effect of stocks on the scions grafted on them was observed. It is shown, however, that the stock/scion adjustment may not be completed during the first season's growth, so that the vegetative vigour and yield of an annual variety may be considerably affected. During the period of adjustment the habit of the grafted plant may be regarded as a compromise between the normal habits of the types providing stock and scion. An interesting aspect of stock/scion adjustment is that when the vigour of two varieties is determined by different limiting factors, the types obtained by reciprocal grafting may be superior to both the original varieties; a phenomenon which is analogous to hybrid vigour is therefore produced. In addition to "general habit" stock/scion adjustment, which was of major importance at high levels of stock vigour, there were indications of a second type of adjustment—viz., the preference of Asiatic scion for Asiatic stock and of New World scion for New World stock, which operated independently, and which was manifested only at low levels of stock vigour. Changes in scion yield corresponding with changes of stock are analogous to changes induced by varying levels of soil fertility. At the lower levels, replacement of one stock by a better one results

in an all-round increase of yield—both number and size of bolls are augmented. At the higher levels change of stock is accompanied by a readjustment of the yield components; boll number and boll size can no longer vary additively. These results may appear to be at variance with general grafting experience obtained with orchard crops, which show a marked and prolonged response of scion to stock. The present data, however, show that in cotton, at any rate, the length of the period of stock/scion adjustment depends on the habits of the varieties grafted, adjustment being considerably slower when perennial or semi-perennial varieties are involved.

450. Inheritance of Oil Glands in Pima Cotton. By R. H. Peebles and E. G. Smith. (*J. Agr. Res.*, **66**, 12, 1943, p. 447.) Smooth boll surface and three previously undescribed oil gland characters—namely, delayed development of the boll glands, small and deeply embedded stem glands, and small calyx glands—characterize a family of Pima cotton (*Gossypium barbadense*, L.) known as P Hope. The contrasting characters—namely, pitted boll surface, early development of the boll glands, large and shallowly embedded stem glands, and large calyx glands—are found in PH8, a representative family of normal Pima cotton. Observations made in segregating populations of the cross PH8 × P Hope strongly indicate that the characters mentioned above do not segregate independently, but, on the contrary, occur only in the combinations existing in the parent families and in F_1. This association of the characters is tentatively accounted for as an instance of manifold expression of a single pair of genes rather than as complete linkage. Ratios obtained in F_2 and backcross populations agree fairly well with expectations based on the assumption of a single-factor difference. Monohybrid inheritance previously had been found to be the mode of inheritance of pitted boll surface and smooth boll surface, for which the symbols are respectively B^p and B^s. All the above-mentioned characters are intermediate in F_1. A remarkable increase in number of boll glands occurs in F_1, also in the heterozygous class in F_2 and backcross populations. The mean number of boll glands in F_1 nearly equals the sum of the means that obtain in family PH8 and family P Hope. This is a noteworthy manifestation of heterozygosity, which may be explained by assuming that the genes B^p and B^s are complementary in respect to number of boll glands, either gene alone giving rise to only half the number of glands that appear when the two genes are brought together in the heterozygote.

451. Relation of Green Lint to Lint Index in Upland Cotton. By J. W. Neely. (*J. Agr. Res.*, **66**, 8, 1943, p. 293.) Crosses were made between two strains (Arkansas green lint and Half-and-Half white lint) of Upland cotton (*Gossypium hirsutum*, L.), characterized respectively by green lint, low lint index, and white lint, high lint index. The F_1 was intermediate green with a mean lint-index value that was intermediate between those of the two parents. In the backcross generations, satisfactory 1 : 1 ratios of green to intermediate green or intermediate green to white were obtained. In the F_2 generation, satisfactory 1 : 2 : 1 ratios of green, intermediate green, and white were obtained. The previous conclusion that the characteristic is controlled by one genetic factor pair is confirmed. In the analysis of samples from the backcross, F_2, and F_3 phenotypes, it was shown that green lint and low lint index are very closely associated. Linkage fails to account for the association. When high lint-index factors from the white-lint stock are combined with the green-lint gene, the green-lint gene suppresses the expression of the lint-index genes. The green-lint and lint-index association is largely due to the pleiotropic effect of the basic green-lint gene. The effect appears to be one of "spurious pleiotropy," the green-lint gene affecting the pigmentation in the fibre wall. In turn, the pigmentation prevents the development of the fibres. The result is that green fibres have thin walls and small minor diameters and consequently very low lint-index values. It is indicated that green-lint types with a lint index approximating that of commercial white cottons cannot be developed through breeding. Perhaps the "spurious pleiotropic" effects of factors may account for many cases of so-called antagonism between characteristics of domesticated plant species.

452. Heritable Relation of Wax Content and Green Pigmentation of Lint in Upland Cotton. By C. M. Conrad and J. W. Neely. (*J. Agr. Res.*, **66**, 8, 1943,

p. 307.) The total wax content of lint from Half-and-Half white lint and Arkansas green lint Upland cottons and of the F_1, backcross, F_2, and F_3 populations of crosses between the two strains was determined. The samples represent two consecutive crop years and three sets of families representing three different crosses. The wax content of the white-lint parent varies within the low limits of 0·48-0·63 per cent. and that of the green-lint parent between the much higher limits of 12·64 to 15·04 per cent. The F_1 was intermediate green with a mean wax content between that of the two parents but closer to that of the white parent. In the analyses of samples from the backcross, F_2, and F_3 phenotypes, it was shown that the green lint and high wax content were closely associated. While there is no evidence against the relationship being one of genetical linkage, it is indicated that the relationship is probably a physiological one and that the genetic factor that affects the green pigmentation also affects the wax content. Previous work has shown that the presence of green pigmentation in the fibre cell wall is associated with a suppressed development of fibre initials into mature fibres. Just what is the interrelationship of cause and effect between high wax content, green pigmentations, and suppressed development of fibre wall remains to be clarified. The results are not conclusive, but it is indicated that there is little likelihood of combining the high wax content of the green-lint strain with the white lint of commercial cotton. It is possible that the genetic behaviour in crosses between other green-lint strains and the same or other white-lint varieties would be different. These studies are being extended to include such crosses.

453. Mock-Dominance and Hybrid Vigour. By F. D. Richey. (*Sci.*, **96**, 2490, 1942, p. 280. Fron *Exp. Sta. Rec.*, **88**, 2, 1943, p. 177.) Two plant varieties, one with twice as many internodes of half the length as the other, will be equal in height. A hybrid between them will exceed their height by 12·5 per cent. if internode number and length are exactly intermediate in inheritance—*i.e.*, without dominance. This effect, here termed "mock-dominance," "results from the fact that plant height is determined as the product of number and length of internodes and from the relations that obtain between the means of products and the product of means." The same principle applies to other characters such as, *e.g.*, yields of grain, leaf areas, growth rates, and chlorophyll content *v.* leaf area. The applications to plant breeding are briefly discussed.

454. Row Widths and Cotton Production. By D. M. Simpson and E. N. Duncan. (*J. Amer. Soc. Agron.*, **34**, 6, 1942, p. 544. From *Exp. Sta. Rec.*, **88**, 6, June, 1943, p. 760.) A review of row width experiments with cotton at several stations indicated that narrow rows yield more per acre while wider rows yield more per row. Since planting and cultivating operations are done by the row, row footage per acre is important in determining production costs. Row widths may be varied from 2·5-4·5 ft. without materially changing cost of cultivation per row, and, in general, should be adjusted so as to result in the lowest cost per lb. of cotton produced or the greatest production return for labour and equipment. In experiments at Knoxville, Tennessee, 1938-40, yields of cotton per row increased consistently and profitably as row widths were widened from 2·5-4·5 ft. Optimum row widths may depend upon local conditions regarding land value, labour, and equipment costs.

455. Variations in the Measurable Characters of Cotton Fibres. IV. Variations with the Age of the Plant. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, xii., **4**, 1942, p. 627.) For the purposes of the experiment seven pure strains of cotton grown at the various Agricultural Research Stations in Madras were chosen, and weekly pickings were made for the measurement of seed weight, lint weight, ginning percentage, mean fibre length, fibre weight per cm., standard fibre weight, number of fibres per seed, maturity, fibre strength, convolutions per cm., mean ribbon width. Variations among the pickings were observed in seed weight, lint weight, mean fibre length, number of convolutions per unit length, number of fibres per seed, and fibre strength. In general, a reduction in these characters was noticed in the last pickings, though in some cases there was a reduction trend even from the earlier stages. The fall in the number of convolutions per cm. was very conspicuous in two cottons.

456. LIGHTNING INJURY TO COTTON. By A. L. Smith. (*Phytopathology*, **33**, 2, 1943, p. 150. From *Exp. Sta. Rec.*, **88**, 6, June, 1943, p. 772.) Considerable variation in the general appearance of lightning-struck spots in cotton fields was observed, sudden killing in circular areas resulting in those more frequently encountered. More difficult to diagnose were the somewhat indefinite and variable spots with delayed and dispersed appearance of symptoms, without noticeable centralized killing, and extending over areas as much as 300 ft. in diameter. Immediate killing results from collapse of tissues exterior to the xylem in stems and larger roots. Surviving plants almost invariably exhibit a collar-like enlargement at or just below the soil line where the plants are completely or occasionally partially girdled. This girdling is due to the killing of cortical and cambial tissues in a band usually about 0·5 in. wide. Other symptoms on survivors include irregular longitudinally elongated necrotic areas on the stems. *Rhizoctonia bataticola*, reported as parasitic on certain Asiatic cottons, frequently invades the lower stem and roots of lightning-injured Upland cotton (*Gossypium hirsutum*) in Georgia.

457. THE RÔLE OF ISOLATION IN THE DIFFERENTIATION OF PLANT SPECIES. By G. L. Stebbins (Junr.). (*Biol. Symp.*, **6**, 1942, p. 217. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 211.) Many plant species are instanced to show that geographical isolation, even over millions of years, does not necessarily lead to cross-incompatibility or sterility, and that the degree to which species or races differ morphologically is no criterion of their degree of intersterility. Genetic isolation is thought to have evolved by the gradual accumulation of small differences. Recombinations of these may occasionally result in the sudden production of a new species.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

458. THE MATHER LECTURE. TEXTILE RESEARCH AND DEVELOPMENT. By Sir Robert Pickard, F.R.S. (*J. Text. Inst.*, June, 1943, p. 95.) The science of textiles is a very wide one, and cannot be accurately defined. It embraces portions of almost every form of study to which the name of science has been given, and its practice includes research and investigation. The application of research—the reception of ideas and their utilization—depends upon the education of the people to whom the results may be of possible use, and up to recent years the position has not been very satisfactory. Textile departments in the great majority of the technical colleges teach the textile technology—as distinct from the science—of one fibre only, and there would appear to be no special teacher of rayon technology. A general plea is put forward by the lecturer for the academic world to take more cognizance of general textile technology, including the utilization of rayon. Textile science is a development of the period between the two wars, and during this period the well-known laboratories have been largely devoting their efforts to a meticulous examination of the properties of the different fibres, their characteristics, and behaviour under different conditions. This has led, in the main, to facilitating the choice of fibres for a cloth to fulfil certain requirements, on the one hand, and on the other, to the control and elaboration of what may be called chemical finishes. Three examples are given illustrating the ways in which scientists have been applying their efforts to the improvements of textiles: the self-sealing cloth and water-holding canvases developed by Dr. Peirce; the Velanizing process of Imperial Chemical Industries; and the Tootal Broadhurst Lee Co., Ltd., anti-crease process. Referring to the Shirley Institute, the lecturer said that it has developed from very small beginnings, and its phase of development is still only at the beginning. It has a long way to go yet, but the possibilities for such a scientific institution of serving the cotton, rayon, and silk industries are by no means exhausted. With regard to exact measurements, quality, and control of processes the Shirley Institute has become the scientific bureau for the trade, and should be in a position to advise upon the application of new scientific methods to industry. The Institute has received from the Government one of the new very powerful electron microscopes sent to this country from America, in order that an attempt may be made to apply it to research work in

connection with cotton, rayon, and silk, or to industrial processes. Nearly all textile fibres vary in their characteristics—even the fibres of one given type are very variable—and all are sensitive to atmospheric conditions. Reproducible experiments, therefore, have to be done on an elaborate scale under atmospheric control, and the assistance of a large number of routine workers is necessary. Such conditions emphasize the need for a central research establishment. There is great difficulty in getting the results of research across from the laboratory to the mill owing to a certain temperamental difficulty which is particularly resistant in the textile world: neither the manufacturer nor the worker wants his established order and standard lines upset. The financial resources of research associations have always been strictly limited, and efforts must therefore be directed to getting the best value for the sums expended. For this purpose, the association must be fully informed of, and must thoroughly investigate what the lecturer termed "the economics of production," and in this connection there is a vast field for investigation. To put far-reaching results into practice takes a very long time, and for this reason there is not the same incentive on the part of the industrialist to pay heavily for research work which will benefit his successors. Hence it is also the State's function to foster fundamental scientific research, and the aid provided should be continuous. Incidentally, the State has provided so far 20 per cent. of the total resources of the Shirley Institute. Another important function of a research association is that it provides a connecting link between spinners, manufacturers, and finishers. In connection with the post-war reconstruction period and the rehabilitation of Europe the prospects of mass production of fabrics are discussed, and the need for the development of the industrial research movement is stressed. Reference is also made to the coming development of plastics. With regard to the prospects for synthetic fibres, the opinion is expressed that the use of these will not mean the elimination of natural fibres. Any fibre in general use possesses some little something which the others have not, and it is the choice of these characteristics, relatively to their price, and within the limits of raw material available, which will determine the relative consumption of the different fibres.

459. Cell Wall Substances: Enzymic Degradation. By D. H. F. Clayson. (*Chem. and Indus.*, 1943, **62**, p. 49. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 130.) The nature of hemicelluloses and the digestibility of these compounds by enzymes are discussed. Work on the biological decomposition of lignin and cellulose is reviewed, and the separation of cyto-hydrolytic enzymes is discussed. The conclusion is drawn that as the plant cell wall develops and assumes skeletal functions it becomes more resistant to degradation by biological agencies. The lignification process is associated with this increased resistance, probably for the following reasons: (*a*) Lignin is not readily disrupted by enzymes. It is subject to slow oxidative changes and, judging by the extremely slow decomposition of wood in bogs and deep water, is not affected by reductive changes. (*b*) Lignin in the woody tissue acts as a physical barrier to the penetration of enzymes and other hydrolytic agents and is possibly chemically combined with the uronic acid groups which would otherwise be the more vulnerable points in the remaining tissues. The more mature cell wall substance is also more resistant to enzymic degradation by reason of the complexity of its chemical constitution and consequent diversity of groupings present. If these groupings each require specific enzymes, the enzymes must be present simultaneously in order that uninterrupted degradation may occur, unless some preliminary disruptive process is introduced whereby each enzyme can penetrate its respective substrate. Consideration of the disruptive effect of various mild chemical treatments on textiles suggests that some of the end-products of fermentation, particularly organic acids, may have a similar effect on natural fibres. This disruptive effect may be independent of the enzymic degradation or some of the agents producing it may function strictly as co-enzymes.

460. Cotton Cellulose: Electron Micrography. By R. B. Barnes and C. J. Burton. (*Ind. Eng. Chem.*, 1943, **35**, p. 120. From *J. Text. Inst.*, May, 1943, A256.) When attempts were made to examine whole cotton fibres of the order of 18μ in diameter under the electron microscope the fibres were observed to swell locally,

burst, and become charred. Observations on 15-day and mature cotton fibres which had been mechanically disintegrated in aqueous suspension showed the presence of two rather distinct phases, one fibrous and the other apparently amorphous and extremely opaque to electrons. Electron micrographs obtained at 6,000 diameters are shown.

461. CELLULOSE: HYDROLYSIS. By R. F. Nickerson. (*Ind. Eng. Chem.*, **34**, 1942, p. 1480. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 161.) Samples of cellulose in the form of unmercerized cotton cloth, mercerized cotton, industrial cotton linters, hydrocellulose obtained by boiling linters for 4 hours in hydrochloric acid-ferric chloride reagent, wood pulp, and viscose rayon were digested for 7 hours in boiling 2·4 N hydrochloric acid-0·6 M ferric chloride, and the accumulated carbon dioxide was determined at frequent intervals. Solid residues of hydrocellulose present as dispersions at the end of the runs were recovered. A typical carbon dioxide/time curve is shown and curves are given showing the calculated percentages of cellulose hydrolyzed against time for the various samples. Calculated hydrolysis, observed recoveries, non-crystalline contents, reactivities of crystalline components, and specific viscosities are tabulated and discussed. It is pointed out that the amounts of crystalline and non-crystalline cellulose in the samples vary between wide limits. The reactivity values for the crystalline components suggest that the crystallites of native celluloses are much alike in behaviour. In the case of linters, severe prior hydrolysis does not appear to alter the reactivity. Mercerization and viscose processing seem to produce a substantial increase in crystallite reactivity. Data showing the variation of moisture regain capacity with time of treatment in boiling hydrochloric acid are tabulated and curves are given showing moisture adsorbed by residue from 100 g. intact material against per cent. of intact material hydrolyzed. The data and graphs indicate that, in the adsorption of moisture, the intact samples are heterogeneous. One component is highly hygroscopic, is present in relatively small amount, and is quickly removed (in 3 minutes under the conditions studied) by acid hydrolysis. The other is much less hygroscopic, represents the bulk of the material, and hydrolyzes slowly. Differences between the curves for the different samples are discussed, and it is suggested that the crystallites have different moisture permeabilities. The crystallites of viscose appear to be completely permeable, the crystallites of mercerized cotton less permeable, and those of unmodified cotton more or less completely impervious. The moisture regain data suggest that structural homogencity is produced by 3 minutes of hydrolysis, whilst the hydrolysis measurements indicate that about 1 hour is required under the conditions of the experiments. It is possible that the 3-minute period represents the amorphous component and the 1-hour period the mesomorphous. The crystallite reactivities seem to vary as the permeabilities.

462. SUBSTITUTED COTTON CELLULOSE: STRUCTURE. By R. Haller. (*Kolloid Z.*, 1942, **98**, p. 332. From *J. Text. Inst.*, April, 1943, A219.) The behaviour towards the usual cellulose reagents of cotton that has been chemically modified (*e.g.*, by esterification or etherification) without loss of the natural structure has been examined, chiefly microscopically. The chemical changes found in various products are shown to be deep-seated or superficial according to whether the reaction mixtures used in their preparation are or are not swelling agents for the resulting ester or ether. The " immunity " of certain products toward substantive dyes is due to the presence of a layer of a non-dyeing substitution product which protects the underlying unchanged cotton. All such " immune " products are dyed red by diamine-blue 3R, not blue as with normal cotton; this behaviour is attributed to the presence in this dye of a fraction of high dispersity.

463. COTTON CARDING. By L. Lunn. (*Text. Wkly.*, **31**, 1943, p. 304. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 141.) A report of a lecture and discussion. Faults in the cotton, such as broken, short and immature fibres and neps, are briefly discussed, essentials of good carding are outlined, a table of average settings is given, and the importance of attention to the condition of the taker-in and to grinding and cleaning operations is pointed out.

464. COTTON CARDS: SPEED. (*Cotton*, U.S., **106**, 11, 1942, p. 107. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 141.) Two answers are given to a question concerning increasing card speeds to increase production and whether the licker-in speed should be increased from 400 to 600 r.p.m. if the doffer speed is changed from 6 to 9 r.p.m. In the first it is pointed out that increases in speed will probably cause a deterioration in quality or an increase in waste, and the results of experiments in which the licker-in speed was increased to values up to 540 r.p.m. are discussed. The effects on breaking strength, waste, etc., were determined. With blended American cotton of Middling grade a speed of 172 r.p.m. is recommended for the card cylinder. In the second answer it is pointed out that reports from 40 mills in Georgia indicate that the average licker-in speed is 433 r.p.m. for an average diameter of a little over 9 inches on the licker-in, whilst the average doffer speed is 9·7 r.p.m. The action of the licker-in and the effects of increasing its speed are discussed, and it is suggested that with a doffer speed of 9 r.p.m. the speed of the licker-in could safely be increased to 475 r.p.m. on American cotton up to 1⅛ inches staple length, probably without having to alter any settings.

465. COTTON FIBRES: FINENESS. By R. R. Sullivan and K. L. Hertel. (*Text Res.*, 1940, xi., p. 30. From *J. Text. Inst.*, May, 1943, A256.) It is suggested that surface per gram is a suitable measure of fineness for cotton fibres. An air-flow method of determining this quantity to within a standard error of 3 per cent. is described and two calibration curves, one for high- and one for low-porosity wads of fibres, are given. Analyses indicate that the mean from single air-flow tests on each of three 0·1 g.-wads gave the same accuracy as did the mean from microscopic measurements of 2,500 individual fibres.

466. FIBRES: FINENESS MEASUREMENT BY AIR PERMEABILITY METHOD. By M. A. Grimes. (*Text. Res.*, **13**. 1, 1942, p. 12. From *J. Text. Inst.*, April, 1943, A204). Details are given of a method and apparatus for the determination of fibre fineness similar to those described by Sullivan and Hertel. A wad of the fibre is contained in a cylinder provided with a plunger with perforated ends and connected to a flask containing oil. A tube forming a manometer is joined to the neck of the flask. Oil is allowed to flow from the bottom of the flask at a constant rate so that air is drawn in to the top through the wad of fibres. This movement produces a pressure change which, when it becomes constant, is read on the manometer. If desired, the surface per gram of fibres can be calculated. By keeping the weight of specimens and the rate of flow of oil constant, the pressure difference values can be used to compare samples. The results of measurements on 36 cottons, the fineness of which had been determined by the weight-per-inch method, are given. The tests were made with the fibres parallel to the direction of air flow. Comparisons of fineness determinations by this method, by the weight-per-inch method and by the surface-per-gram method of Sullivan and Hertel agree closely, showing that the three methods are of approximately equal accuracy as measurements of fineness. It is pointed out that the air-permeability method requires less expensive equipment and less time for learning the technique and for making the determinations than the weight-per-inch method of determining fineness.

467. COTTON FIBRE BUNDLES: STRENGTH. By R. W. Webb. (*Text. Res.*, **13**, 4, 1943, p. 18. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 306.) Tests by the Chandler round wrapped bundle method and the Pressley flat unwrapped bundle method have given an average strength value of 80,000 lb. per sq. in. for American Upland cottons, some results being as high as 106,000 lb. per sq. in. Average values of 85,000-90,000 lb. per sq. in. have been obtained for American-Egyptian cotton, and of 95,000-110,000 lb. per sq. in. for Sea Island cotton. Sea Island fibre bundles containing 1, 2, 3 and 4 turns per bundle, corresponding to 1·60, 3·20, 5·33 and 8·00 twists per in., gave average fibre bundle strengths of 93,500, 80,200, 65,900 and 48,100 lb. per sq. in. compared with 98,900 without twist.

468. COTTON FIBRE STRENGTH TESTER. By E. H. Pressley. (*Amer. Soc. Testg. Mat. Bull.*, No. 118, 1942, p. 13. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 157.) In a rapid method of determining the relative strength of cotton fibres, a ribbon of

proper size is drawn from a prepared bundle, passed through a fine comb a sufficient number of times to remove all neps, trash and short fibres, and then placed in clamps under sufficient pressure to prevent slippage. The ends of the fibres are cut off against the sides of the clamps, the clamps are placed in the testing device, and the ribbon is broken. The number of pounds required to break the ribbon are read from a scale and recorded. The clamps are then removed and the broken fibres recovered for weighing. This weight divided into the number of pounds read from the scale gives the strength index of the ribbon tested. The index is in reality the number of pounds required to break a milligram of cotton of a standard length of approximately 0·460 in. The figure varies from 5·72 lb. for weak fibre to 10·53 lb. for strong Sea Island cotton. A photograph of the tester and a table of experimental results are given. Results are compared with those obtained by the improved Chandler method and the agreement in regard to relative strength is shown to be close. The value of the rapid method for comparing the lint of cotton selections in breeding work is pointed out. A sample whose strength in pounds per square inch is known should be tested in rotation with all samples whose relative strength is being determined so that allowances can be made for changes in laboratory conditions, etc., and a factor determined for translating strength indexes into pounds per square inch.

469. FIBRES: ACTION OF ACIDS; MICROSCOPIC OBSERVATIONS. By H. C. Haller. (*Amer. Dyes Rpt.*, 1942, **31**, p. 681. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 125.) A table is given showing the action of 70 per cent. sulphuric acid on cotton, silk, wool, kapok, and other animal, vegetable, and artificial fibres. A few fibres were treated with the acid and measurements were made with the ocular micrometer. Initial reactions, appearances after 10 minutes, and swelling ratios are recorded. Reactions of some of the fibres with 50 per cent. nitric acid are also shown.

470. BUNDLES OF PARALLEL FIBRES: SPECIFIC SURFACE MEASUREMENTS. By R. R. Sullivan. (*J. App. Physics*, 1942, **13**, p. 725. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 124.) The flow of air through compact bundles of parallel fibres has been studied in order to obtain values of the shape factor k_o for the channels through which the flow takes place. When the fibres are cylinders and the flow is parallel to the axes, k_o is an increasing function of the porosity ϵ. For fibres such as cotton, where the shape and size of cross-section change along the fibre length, k_o changes less rapidly with ϵ. Data are given for this relationship. Examples of specific surface determinations of Aralac, cotton, and viscose rayon fibres by the parallel-flow air permeability method are given, and the results are compared with those obtained by other methods.

471. TEXTILE FIBRES: PROPERTIES. By W. von Bergen. (*Mech. Eng.*, **65**, 1943, p. 183. From *J. Text Inst.*, July, 1943, A361.) The microscopical structures and physical and chemical properties of wool, silk, cotton, and other fibres are described, and photomicrographs, stress-strain curves, and tables showing elastic constants for various fibres and metals, relative wet breaking strengths of various yarns, and moisture regains, specific gravities and chemical properties of various fibres are given. The influence of fibre properties on manufacturing processes and on finished products is discussed.

472. COTTON FABRICS: MERCERIZING. By A. V. Surovaya. (*Khlopchatobumazhnaya Prom.*, 1939, **12**. From *J. Text. Inst.*, March, 1943, A133.) Mercerizing tests were made on three different types of fabrics, differing as to weight in the raw, scoured, and bleached condition. Regardless of the mercerizing process light-weight fabrics were found to mercerize most easily. With increase in the weight of the fabric, the effect of the mercerizing was poorer. The highest mercerizing effect was obtained by treating the fabric in the boiled condition.

473. COTTON FABRICS: WEARING QUALITY AND FLUIDITY. By A. V. Surovaya and A. P. Zakoshchikov. (*Khlopchatobumazhoĭ Prom.*, 1939, p. 109. From *J. Text. Inst.*, March, 1943, A149.) The existence of a direct relation between the viscosity of the solution of cuprammonium cellulose and the wearing properties of the fabric was verified experimentally, and a method for the control of the strength of cotton fabrics from this viscosity was developed. The effects of washing and of light on

fabrics in relation to the viscosity of their solutions were studied. In determining the relation between the strength of the individual cotton fibres of various grades and the viscosity of their solutions it is necessary to take into account the area of the cross-section of the fibre.

474. HARGREAVES' SPINNING "JENNY": HISTORY. By W. A. Hunter. (*Text. Wkly.*, 1943, **31**, p. 233. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 115.) A brief history of James Hargreaves and his invention of the Spinning "Jenny." The usual statement that Hargreaves was a weaver of Blackburn is incorrect. At the time of the invention of the Spinning "Jenny" in 1764 he lived in the village of Stanhill, near Accrington. A number of the machines were made between 1764 and 1767, and some were used in a neighbouring mill owned by Mr. Robert Peel. In 1768 a Blackburn mob broke up the machines and ransacked Hargreaves' home. Hargreaves then left Stanhill and settled in Nottingham, and in partnership with a Mr. James established a mill in which yarns for local hosiers were produced on Spinning "Jennies." The patent for the Spinning "Jenny" was not obtained until 1770.

475. COTTON-SPINNING MILL: REORGANIZATION. By J. Airey. (*Text. Wkly.*, 1943, **31**, p. 458. From *Summ. Curr. Lit.*, xxiii., **8**, 1943, p. 209.) A report of a lecture giving an outline of modern practice in cotton spinning, including control testing and estimates of production per machine, and making suggestions for post-war developments. A discussion is reported.

476. POST-WAR MODERN COTTON SPINNING. Pts. II. and III. By J. Buckley. (*Text. Mnfr.*, lxix., March, April, 1943, pp. 115, 161.) Deals with the subject of Cotton Opening and Lap Forming under the headings of: Openers, major cleaners, dust extraction, waste recovery. Photographs and diagrams of the various pieces of machinery described are included.

[*Cf.* Abstr. **238**, Vol. XX. of this Review.]

477. THE INSTALLATION OF FUTURE COTTON-SPINNING MILLS. By J. Buckley. (*J. Text. Inst.*, January, 1943, p. 1.) The author states that the average age of Lancashire mills is 40 years, and only 5 new cotton-spinning mills have been erected in the country since 1918, a period of 24 years. Of the total spindles in existence 72 per cent. are mule and 28 per cent. ring spindles; 70 per cent. of the world's mule spindles are in Great Britain, with their relatively low production capacity and high production costs. In the writer's view these ratios will need to be altered if Lancashire is to maintain her position as one of the leading cotton goods producers of the world. Modern equipment installed in the cotton-spinning mills of Lancashire in the future would assist the solution of some of the major problems now confronting the trade. The writer then proceeds to briefly describe the recent developments in single-process lapping, dust extraction, carding, combing, drawing, lap winding and drawing, multiple coiler drawing systems, high draft and graduated draft speed frames, ring spinning and ring doubling frames, individual electric drives, and the production and use of large packages. The opinion is expressed that for counts up to 100's at least high-draft ring frames should replace mules except in very special circumstances. The correct planning of mills is discussed and the need for attention to cleanliness, air-conditioning, comfort and training of operatives, and welfare and social amenities, is stressed. In conclusion the author emphasizes the importance of planning now for future mills, and suggests that schemes be prepared in readiness to come into operation immediately hostilities cease.

478. THE INSTALLATION OF FUTURE WEAVING PLANTS. By E. Snowden. (*J. Text. Inst.*, May, 1943, p. 89.) The author suggests various improvements in connection with weaving machinery, the training of personnel in future weaving mills, and summarizes the general conditions that should be adopted in order to make the cotton industry more attractive to its employees.

479. A SENSITIVE HUMIDISTAT. By W. O. Williams. (*Sci.*, **95**, 2463, 1942, p. 283. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 491.) The humidistat described and illustrated possesses a control operated by the differential in temperature between ether-filled wet and dry bulbs, the difference in vapour pressure of ethyl ether contained in the

bulbs due to this temperature difference displacing a mercury column across the platinum contacts sealed in the connecting tubing. Approximate adjustment is obtained by varying the amount of mercury in the manometer tube by adding to or subtracting from a reserve supply stored in the bulbs, and final adjustment is made by swinging the instrument about a pivot.

480. Catalytic Hydrogenation of Cotton-Hull Fibre. By H. R. Henze *et al.* (*Jour. Organic Chem.*, **7**, 1, 1942, p. 38. From *Exp. Sta. Rec.*, **89**, 1, July, 1943, p. 18.) From 300 gm. of cotton-hull fibre there was formed, by the action of 8·11 moles of hydrogen at 250° C. and under pressures of 325-380 atmospheres in the presence of 7 per cent. of sodium hydroxide and Raney nickel, 3·31 moles of gaseous hydrocarbon (chiefly methane), 0·15 mole of carbon dioxide, and 2·39 moles of acidic material. The acidic material was found to contain lower fatty acids, including acetic and possibly propionic and one of the butyrics or both; lactic acid; γ- or δ-hydroxycaproic acid and the corresponding lactone; and a dihydroxyvaleric acid and the corresponding lactone, with one hydroxyl of the acid in the α-position and the other probably in the δ-position. Under the conditions described cotton cellulose did not undergo hydrogenation at 225°.

481. Illness Caused by Low-Grade, Stained Cotton. By P. A. Neal *et al.* (*J. Amer. Med. Assoc.*, 1942, **119**, p. 1074. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 317.) People engaged in making mattresses and some others in a cotton mill and cotton-processing plants handling a low-grade, dusty, yellow- or brown-stained cotton suffered from an illness coming on a few hours after inhaling cotton dust, characterized by fever, anorexia, nausea, and vomiting, generalized aching and fatigue. Chemical and mycological examination revealed nothing to account for the effects, but bacteriological examination showed the fibres to contain large numbers of rod-shaped organisms, and cultures gave profuse and almost pure growths of a capsulated motile Gram-negative bacillus, classed as a species of *Aerobacter*. The same organism was recovered from the dust of this cotton and from dust in a cotton mill in which "mill fever" had occurred 3 years earlier; normal cotton did not contain it, yielding mixed and much less profuse growths of indifferent bacteria. Extracts of the cotton and filtrates of cultures of this organism contained a heat-stable toxic substance producing vomiting and diarrhœa in cats and eliciting a Schwartzman reaction in rabbits. Intradermal injection of cotton extract or culture filtrate produced severe inflammatory reactions in human skin. The inhalation of infected cotton dust had no distinct effect on six species of animal, but in human volunteers inhalation of either naturally infected cotton dust, dust from normal cotton artificially infected, or filtrates of cultures of the cotton bacterium, produced illness corresponding to that observed in mattress makers. When the material inhaled contained the living cotton bacterium, this could sometimes, but not always, be cultivated afterwards from nose and throat swabs; blood cultures were always negative. It does not appear that the cotton bacterium produced an infection; its effects are considered to be due to an endotoxin. It is pointed out that the illness shown by these investigations to be produced by inhaling the cotton bacterium resembles "mill fever," "Monday fever," and "gin fever" in cotton-mill workers, and other febrile conditions seen in workers in flax, jute, and grain.

482. Art of the Ancients: A Panorama of Cotton and Other Textiles from Earliest Days. By M. D. C. Crawford. (*J. New York Bot. Gdn.*, 1942, **43**, p. 285. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 209.) The writer, at the beginning of his paper on the history of the textile development of cotton, remarks that we have not produced a single useful species of plant or animal, since all the economic types come from some earlier age.

TRADE, PRICES, NEW USES, ETC.

483. Cotton Supply and Markets. By J. A. Todd. (*Text. Mnfr.*, June, 1942, and subsequent numbers.) A continuation of the series of articles commenced in June, 1942, giving month by month a review of the cotton situation at home, in the

United States, India, Egypt, and South America. The most recent article (June) states that at home the raw cotton arrivals remained small, though there were increases from the United States; the arrivals are expected to be adequate to meet Lancashire needs. Resumption of overtime working may increase the rate of raw cotton consumption despite shortage of operatives and absenteeism. In regard to exports, shippers have received permission to export additional quantities of fine goods, which is a welcome outlet to spinners of Eygptian cotton.

United States.—Since the announcement in May of the U.S. Government's plan for the stabilization of wages, costs and prices, the U.S. cotton markets have held narrowly around the 20 cent level. Prospective liberal sales of Government-owned cotton at fixed rates have virtually eliminated bull speculation. On the other hand, there has been little disposition to follow the bear side with all the hazards of the 1943 growing season still ahead. The total amount of Government cotton which the Commodity Credit Corporation is offering for sale is 2,701,000 bales, largely of lower grades and short staples. The Corporation, however, is also empowered to take over cotton in the 1941 and 1942 loans and to offer it to the market if the present Government stock fails to satisfy spinners' requirements for the better qualities. Unless a change is made in the Corporation's selling rates there does not seem any likelihood that the dollar price of cotton will fluctuate much from the 20 cent level for a considerable time. On present prospects, the total carryover of American cotton in the United States at the end of July will be little changed from the 10,700,000 bales carried over at the end of last season. April consumption of all kinds of cotton by the U.S. mills amounted to 939,000 bales, compared with 1,000,000 bales in April of last year. Southern crop accounts are generally favourable. Cultivation has apparently suffered little from the shortage of farm labour, and the application of fertilizers has been fully as generous as last season. Very heavy rains in the upper reaches of the Mississippi and the Missouri in the second half of May, however, resulted in widespread flooding, opening up the possibility of cotton land being inundated when the flood waters descend to the Southern States.

India.—Following an advance in Bombay prices to new high war-time levels, the Government of India took strong action to stabilize the market. A decree was issued enforcing the closure of the Bombay futures exchange and the liquidation of all open contracts in the Jarilla contract at Rs. 565 for the May delivery, and Rs. 568 for the July delivery. Prices were also fixed for the closing out of forward commitments in the Karachi futures market. In both cases the official closing out quotations were appreciably below the rates previously ruling in the open market. In order to ensure the distribution of cotton goods to domestic consumers at reasonable prices, the Government of India has announced its intention of stabilizing values throughout the cotton industry from the raw material to the manufactured article. A comprehensive schedule of maximum selling rates is to be established for the various qualities of raw cotton, yarn, and cloth. The Indian cotton textile industry is operating to full capacity. Most Bombay and Ahmedabad mills are working night and day on a three-shift basis. Consumption of home-grown cotton is being maintained at the record high rate of around 4,500,000 bales for the season.

Egypt and Sudan.—Reopening the Mediterranean should improve the prospects for Egyptian and Sudan exports. No official announcement has yet been made regarding the size of the 1943 cotton acreage, but the area is estimated as close to that of last year.

South America.—In South Brazil cottons of Types 3, 4, and 5 will be in ample supply this season. The harvest is estimated at about 1,750,000 running bales. The Brazilian Government has raised this year's loan rate to Cr. $66 per *arroba* (32·38 lb.) for Type 5 cotton, establishing at the same time a ceiling of Cr. $82 per *arroba*. Exports in May were very small, being restricted to odd cargoes destined either for Sweden or Spain.

In 1943 the Argentine crop promises to be more than sufficient to meet the requirements of the domestic mills, and prospects are that the surplus available for export will be around 50,000 bales.

The Peruvian Government estimates the 1942-43 acreage at 20·2 per cent. less than the previous season. If this estimate is accepted by the United States authorities the Commodity Credit Corporation buying rates will be advanced by about 30 per cent. on those established against the 1941-42 crop.

484. Cotton Problems in the Post-War Period. By F. Longworth. (*Man. Cham. Comm. Mnthly. Rec.*, 30/11/42, p. 207.) The decline in the export of cotton piece-goods during the period 1933-38, the need for control of the industry under present conditions and also for some measure of control after the war, are discussed. The necessity for modernization of plants and of making the industry more attractive to the operatives is stressed, and the prospects for the export trade, the application of the Atlantic Charter, the need for unity within the industry, and the encouragement of private enterprise, are also discussed.

485. Post-War Problems of the British Cotton Industry. By Z. Nawrocki. (*J. Text. Inst.*, February, 1943, p. 26.) The cotton industries of the three major countries producing cotton yarn and cloth—the United Kingdom, United States, and Japan—are compared in regard to capacity, output, exports, costs of production, wages, working hours, profits, changes in recent years—particularly in the period 1920-38—organization, and export trade and home trade policies. The author is of opinion that if the British cotton industry in the future relies on export policy, "textile manufacturers will have to bear all consequences of an acute international competition, and should have the means to lower prices as the need may arise. . . . The industry must be prepared for radical modernization of plant and equipment, changes in commercial organization, long working week, two-shift basis, and eventually lower wages." In support of this view the author discusses the recent developments in the textile industries of China, India, and Japan, and the low wages paid in those countries. The suggestion is made that British exporters should concentrate on exporting finished cloth rather than semi-manufactured goods, and particularly on fine, high-priced specialities requiring skilled labour and the best type of equipment. In the case of the adoption of a home-consumption policy, the future of the textile industry will be determined by the amount of the national income, and especially by that part which is in the hands of families with low incomes. If full employment can be maintained and people can enjoy a high and rising level of living, the future of the textile industry is assured. The need for general planning, adopting a far-sighted policy, is stressed.

486. Cotton Trade: Post-War Economics. By D. Windel. (*Text. Wkly.*, **31**, 14, 1943, p. 16. From *J. Text. Inst.*, February, 1943, A107.) A report of a lecture in which conditions prior to the war were reviewed and proposals made for post-war reconstruction. The proposals include the establishment of an International Central Authority which would (*a*) establish an international currency, (*b*) decide upon a common international language, (*c*) organize the production and distribution of staple primary products in accordance with broad national needs, (*d*) stabilize prices of such products throughout the world in terms of the international currency, (*e*) organize at a later stage the production and distribution of manufactured goods of standard and constant utility, and (*f*) raise living standards in backward countries.

487. Should Post-War Cotton Prices be Stabilized? By A. Bryce Muir. (*Text. Mnfr.*, lxix, May, 1943, p. 192.) Methods of rigid fixing of prices suggested by various national or international "planners" and the many difficulties and dangers associated with them are discussed.

488. Recruitment and Training for the Cotton Industry. (*Text. Mnfr.*, lxix., April, 1943, p. 146.) A meeting to consider recruitment and training for the cotton industry, convened by the Cotton Board, was attended by the President of the Board of Education in Manchester on March 24. Representatives of employers' and operatives' organizations, of educational authorities, and of other bodies, attended, comprising several hundred delegates. A resolution was proposed and passed unanimously that the delegates welcomed the efforts being made to promote organized recruitment, selection and training of young people for the cotton industry,

recommended the appointment of a Committee, equally representative of employers, workpeople, and educationists, to formulate and supervise the execution of a planned programme, and approved the establishment by the Cotton Board of a special department to administer the plans and policy of the Committee.

489. COTTON OPERATIVES: WELFARE. By J. S. Haydock. (*Text. Wkly.*, 1943, **31**, 129. From *J. Text. Inst.*, May, 1943, A283.) A report of a lecture, opening with a sketch of the history of welfare work in the cotton industry, and offering practical hints on measures to secure cleanliness and reduce accidents.

490. JUVENILE COTTON OPERATIVES: RECRUITMENT. By E. M. Gray. (*Text. Wkly.*, 1943, **31**, p. 488. From *Summ. Curr. Lit.*, xxiii., **8**, 1943, p. 236.) A report of a lecture and discussion on the decline in the numbers of juvenile recruits to the cotton industry, its causes and remedy.

491. COTTON SUBSTITUTE FOR LEATHER. (*Cotton*, M/c, 7/8/43.) Reports from the United States indicate that when scarcity in shoe leather became apparent some months ago, much speculation was exercised over the rôle that the cotton textile industry might play in offering a substitute for leather. It was then recalled that cotton-woven soles for summer type shoes had been successfully manufactured on a small scale. Recent developments indicate that the carpet industry may contribute materially to the production of a substitute for shoe soles. Two carpet manufacturers have established the groundwork for considerable production of this material. Tests conducted by shoe manufacturers have proved the wearing qualities and value of the new material. Chemical treatment of the fabric gives it strong wear and an adequate flexibility. This cotton material for soles will be adaptable for all types of shoes.

ADDENDA.

492. AGRICULTURAL RESEARCH INSTITUTES AND THE FUTURE. By Dr. B. A. Keen, F.R.S. (*Nature*, **150**, 5/9/42, p. 282.) The organization and administration of agricultural research, in common with many other national activities, will receive critical, and it may be hoped, constructive attention as a result of the war. Considerable changes will probably occur in the post-war structure of our agriculture which should be accompanied by appropriate new perspective in the agricultural research, advisory and teaching organizations. The present article deals mainly with research in arable agriculture. In the last hundred years of research in arable agriculture there have been two well-defined stages, the second of which is already changing into a third, and the picture is one of orderly and progressive development. The history of Rothamsted well illustrates the sequence. The first stage—the era of Lawes and Gilbert—was a frontal attack on the problem of practical agriculture: the manuring of crops. The method was one of simple and direct field experiments; the function of the laboratories was to produce a mass of expository analytical data on the soils and crops. Valuable novelties were employed in the method of approach; the problem was detached from its context of crop rotations and agricultural systems by growing each crop continuously. The method well served its purpose, for it was quick, and not only gave new information, but the field results were capable of immediate application to practice. With the death of Lawes and Gilbert the first stage closed. The Rothamsted work had shown that agricultural science had extended beyond the scope of any one man, and that the help of research workers in many branches of science was needed if soil and plant relationships were to be further elucidated. This second stage of agricultural research began with modest resources, but the Development Commission, and especially the war of 1914-18, gave it a great impetus. It has now been running for some 20 years in substantially the form planned by its designer, the late Sir Daniel Hall, and the achievements amply justify the faith of his vision, for the boundaries of agricultural science have been greatly enlarged. There were difficulties to overcome such as the problems of fostering team-work so that the new agricultural science should be a coherent whole, and of providing a suitable environment to ensure that technical applications of the scientific advances would not be missed or ignored by the research workers. The method

adopted was to establish—instead of one single large research institute—a number of smaller institutes, each of which took an agreed broad section of agricultural research as its main concern. Another far-seeing provision was to give each institute the widest freedom of control over its own research programme, for the reason that decentralized control works best. In the past 25 years many members of the institutes have studied the organization of agricultural research in other countries, and many overseas visitors have examined our scheme; the almost universal opinion is that none is better than ours and most are less effective. The freedom of development that characterized the second stage of agricultural research has not only produced the third stage as a logical outcome, it has also provided the technical machinery that makes the next stage possible. The statistical design of experiments to secure comparable results of an ascertained degree of accuracy enables the maximum of information to be obtained from a given amount of experimental effort, by combining several related questions in one design. Thus, problems concerning two or more research institutes could be dealt with in the same experiment. Such a scheme of field experiments would need co-operative control by the interests concerned through a committee which might work under the ægis of the Agricultural Research Council. The committee would be responsible for selecting the programme from the various proposals put forward and for combining the selected problems in the most economical manner. Each experimental site would be typical of an important soil and farming system. It is certain that a system of well-distributed replicated experiments will be of the utmost value to the research institutes; it is equally certain that it will enable rapid answers to be given to many urgent post-war agricultural problems of a practical and economic nature. Lest it should be thought that the scheme outlined is merely another fashionable war-time centralization, the following points are stressed: the need for it was apparent before the war; it is a natural development from a second to a third stage of agricultural research; and, finally, it does not call for any significant changes in the control and administration of the research institutes. Contact with colleagues in various other branches of agricultural research leads the author to believe that among agricultural research workers there is general agreement on the situation briefly discussed here, and on the best method of dealing with it.

493. INDUSTRIAL RESEARCH: ORGANIZATION IN GREAT BRITAIN. By P. Dunsheath. (*Engineer*, 1943, **175**, p. 106. From *J. Text. Inst.*, April, 1943, A223.) The position of industrial research in Great Britain is reviewed, and the contribution made by industry through its own laboratories, co-operation between firms for the purposes of research, and the scheme by which the Government supports industrial research, are discussed. Tables are given showing the annual turnover and annual Research Association expenditure of various industries; thus the cotton industry is credited with a turnover of £43,672,000 and expenditure on the Research Association of £95,000. The net output and net output per employee in a number of industries are also tabulated. The present system of patents and publication is briefly discussed. Future possibilities of industrial research are considered and the need for closer contact of science and industry is pointed out. It is suggested that university scientists should go into the factories and workshops, interchange of research staffs should be practised, and facilities for taking refresher courses in the universities should be widely extended. It is pointed out that industrial research requires a live central co-ordinating secretariat which would command respect in the industrial world and would be in contact with a first-class scientific, technological and patent library. Some of the duties of such an organization are indicated.

ERRATUM.

Abstr. **33**, line 2, of June issue: for *J. Agr. Res.*, read *J. Agr. Sci.*

THE EMPIRE COTTON GROWING REVIEW

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